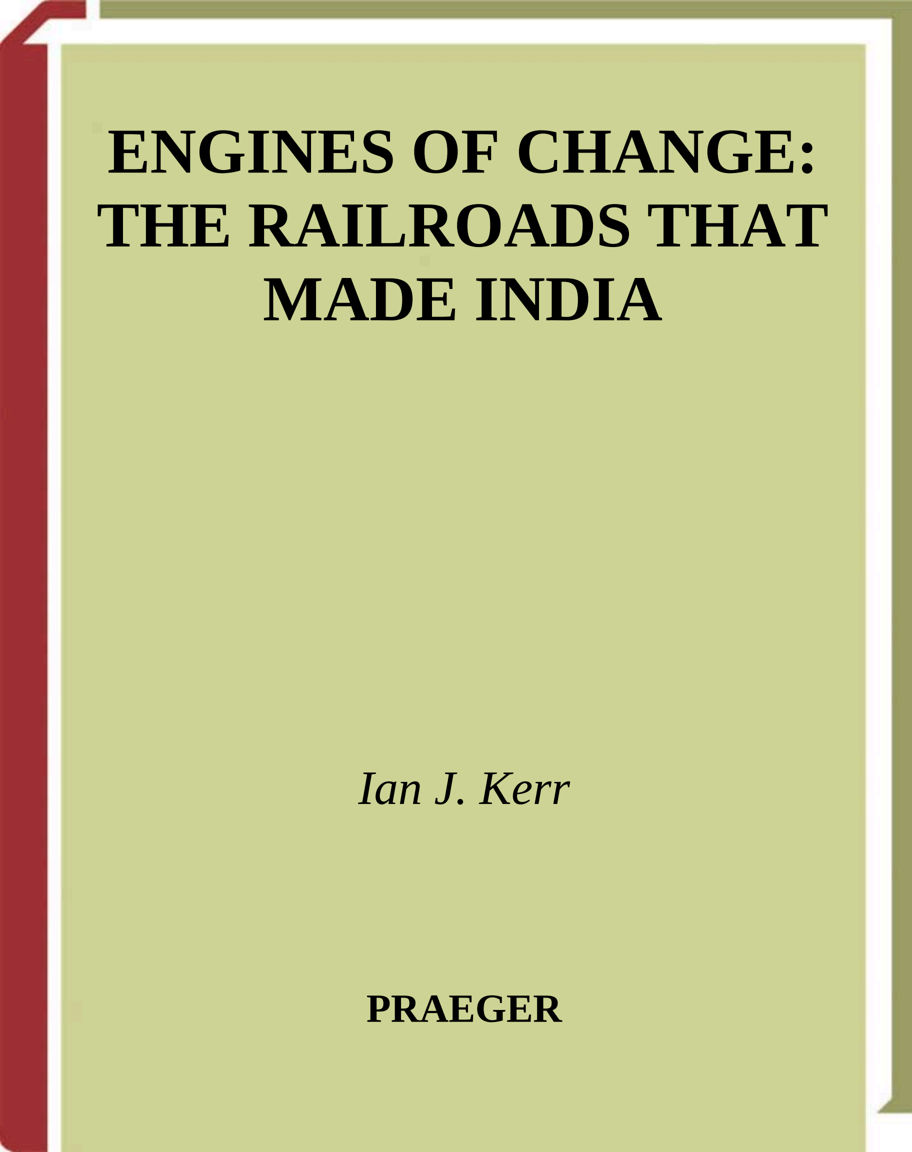

ENGINES OF CHANGE: THE RAILROADS THAT MADE INDIA
Ian J. Kerr
PRAEGER

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For Kaye

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Preface and Acknowledgments

This book tells the story of one of the world's most fascinating railroad systems, that of India. The history of India's railroads is over 150 years old: the first train ran in 1853 and in 2003 Indian Railways (IR), the mammoth state-owned and state-operated railroad system in India, celebrated its magnificent past, its impressive present, and its hope-filled future.

Engines of Change, like the story it tells, depends on the accomplishments of many people, and on writings about India's railroads that began even before the first line opened—books and articles which have swelled in number ever since. This book, in short, depends on the writings of many others (the footnotes and the bibliography indicate the extent of this author's indebtedness), and upon the author's own research in railroad-related records: research and writing that now spans decades and which, at times, has enjoyed the financial support of the Social Science and Humanities Research Council (Canada) and grants provided by funds at the University of Manitoba.

I am indebted to Michael Chrimes, The Librarian of the Institution of Civil Engineers (ICE), London, and Carol Morgan, ICE Archivist, for their assistance with my research, and to ICE for permission to reproduce the photographs from ICE.

The photographs from the Indian Railway Fan Club (IRFC) come from the splendid collection of images found at their Web site (www.irfca.org). They are reproduced with permission of IRFCA, its webmasters, and Samit Roychoudhury. I encourage all who read this book to visit www.irfca.org. It is a wonderful site with images and text that will enthrall anyone interested in railroading past and present. Larsen and Toubro Ltd. kindly provided permission for the use of the photograph in Figure 3.5.

For this project, as for many before it, the staff at the British Library, Oriental and India Office Collections, provided me with invaluable assistance. The records and other materials in their highly professional keeping have always been central to my research efforts.

Roopa Srinivasan kindly undertook a critical reading of Chapter 8, and thereby saved me from my mistakes—the mistakes that remain, in Chapter 8 and elsewhere, are my responsibility. Railway enthusiasts are knowledgeable thus, no doubt, mistakes will be found and, hopefully, communicated to me so that they can be corrected in subsequent versions of this book.

Katy Hunt provided invaluable secretarial assistance. Doug Fast did the excellent cartography. Kaye, my lifemate, helped in many ways with the preparation of the book, as she has helped me for many decades despite the demands of her own professional life.

CHAPTER 1

Introduction

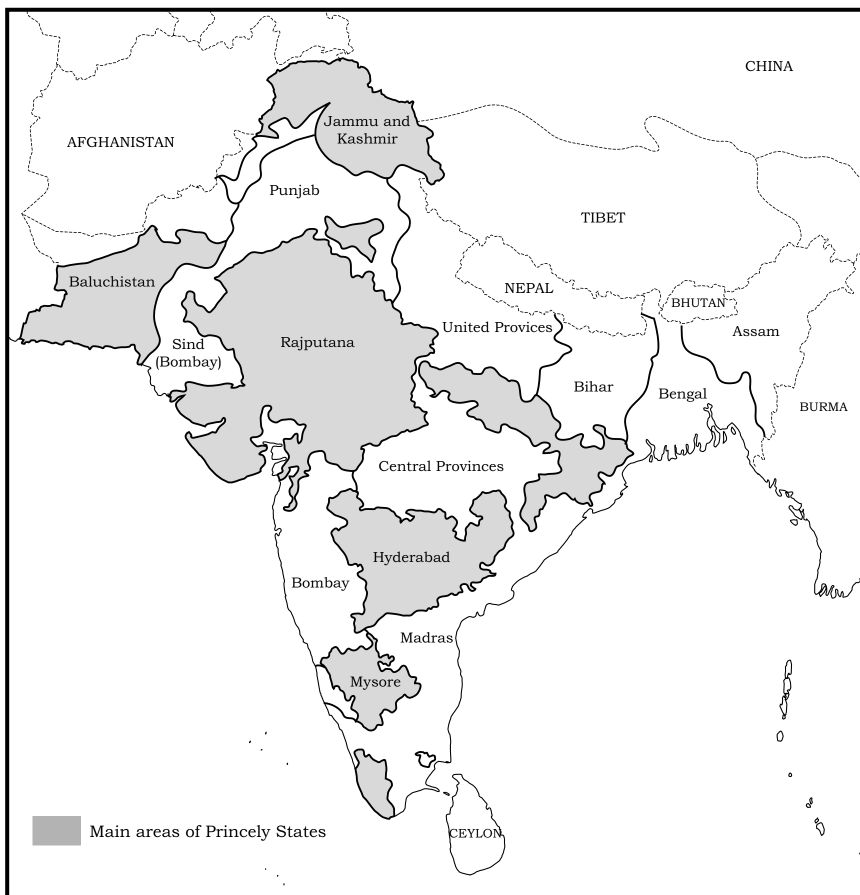
No railroads, no India? Perhaps. What is indisputable is the enormous effect railroads had on India in the colonial and postcolonial period. The railroads were engines of change. As a government minister in political charge of India's railroads wrote in 1988, the history of the railroads depicted "the birth and growth of modern India."[1] This book tells the story of the birth and growth of India's railroads, and explores some of the many ways in which these engines of change shaped the making of modern India and its vast population.

Visitors to India in January of 1850 encountered a fascinating and complicated world within which railroads had no place. Roughly two-thirds of the Indian subcontinent—a landmass that in the 21st century encompasses India, Pakistan, and Bangladesh which, with the addition of Sri Lanka, is often called South Asia—had come to be administered directly by the British as a colonial possession. The remainder of the political landscape was divided among over 500 principalities ranging from the very substantial (larger than some American states) to a miniscule few square miles. The princes, great and small, had to accept considerable British supervision and a ban on direct relations with other states or foreign powers: all extra-state relations went through the paramount power, Britain, whose presence in India was headed by a British governor-general backed by British troops, a British-officered Indian Army, and an elite cadre of British administrators.

Visitors to India today also encounter a fascinating, dynamic, and complicated world, albeit one much changed, in part because of the cumulative effects of the railroads. However, the British did not relinquish control of their Indian Empire until 1947. Thus, crucially, the story of the railroads

Map 1

India, Political and Administrative Divisions, ca. 1900. Note: Map 1 displays the political divisions of India in 1900—some changes occurred between 1850 and 1900 (most of them by 1860) but, on the whole, the political map changed little over the half-century. Other maps, notably Map 2 and Map 3, provide the locations of many of the places, regions, and physical features mentioned in the text.



until 1947—the year of Indian independence—is the history of the construction, development, and operation of a colonial railroad system. Much of what happened was influenced by the colonial context. The railroad history of India from 1947 to 2006—and that of Pakistan and subsequently Bangladesh—is decidedly postcolonial, shaped by the developments of the colonial era even when in opposition to the colonial legacy.

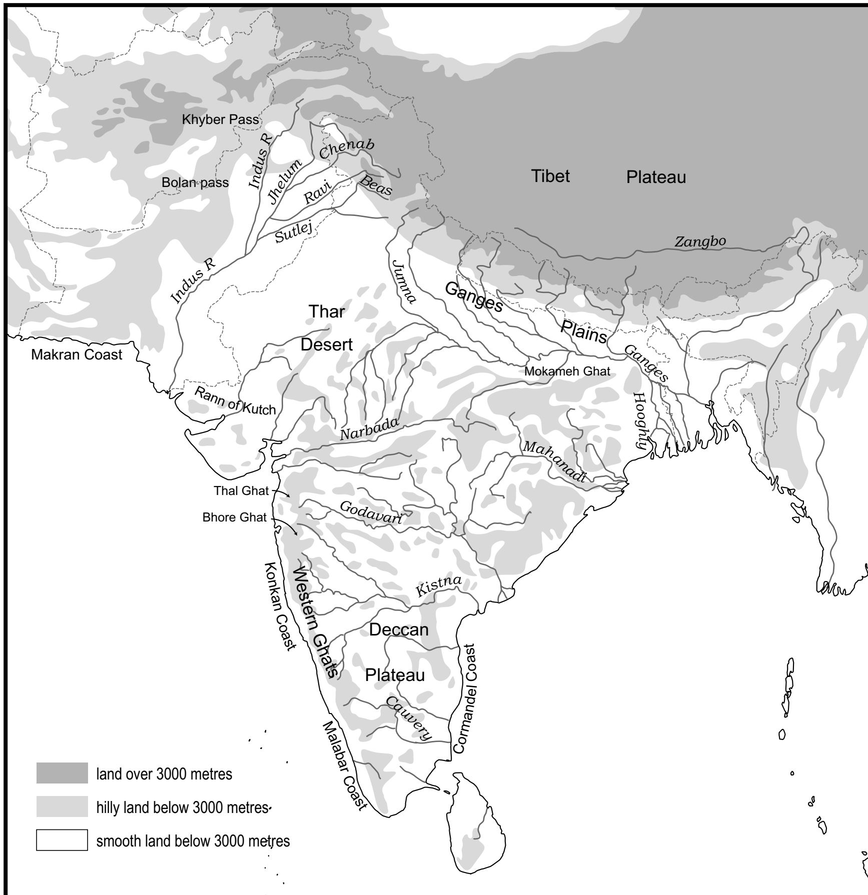
Map 2
South Asia, Places, Regions.



In 1850, as now, the inhabitants of the Indian subcontinent belonged to a number of language groupings, many of which had long, rich, literary traditions. These, in turn, marked the presence of regional varieties of India's main cultural and socioeconomic formations. Hinduism, itself anything but monolithic, was the religion of the majority of South Asians but Islam had a strong presence, and pockets of those with other faiths existed including Jains, Parsis, Sikhs, and Christians.

Aspects of that diversity and hints as to the changes the railroads would help bring about were captured in an evocative statement written in 1885 by an Indian statesman, Madhav Rao (1828–1891), who had been the chief

Map 3
South Asia, Physical Features.



minister of the princely states of Travancore 1858–1872, Indore 1873–1875, and Baroda 1875–1882. He wrote:[2]

> What a glorious change the railway has made in old and long neglected India! The young generation cannot fully realize it. In passing from the banks of the Tambrapurny to those of the Ganges, what varied scenes, what successive nationalities and languages flit across the view! *Tamil, Telegu, Canarese, Marathi, Guzerati, Hindustani, Bengali*—populations which had been isolated for unmeasured ages, now easily mingle in civilized confusion. In my various long journeys it has repeatedly struck me that if India is to become a homogeneous nation, and is ever to achieve solidarity, it must

> be by means of the Railways as a means of transport, and by means of the *English language* as a medium of communication.

Peasant farming practiced by the inhabitants of a great many villages provided the economic base. Dry cereal crops (wheat etc.) predominated, but where water was more abundant wet rice agriculture, with its mosaic of paddy fields, was common. Most of India's 150 million or so inhabitants lived in the villages, although large cities also existed. Sophisticated trading networks supported by well-developed credit arrangements circulated the products of India's artisans and craftsmen throughout the subcontinent and beyond. Indeed, the fine cotton textiles of India had been shipped in quantity to Europe since the 17th century.

India in January of 1850 was not and had never been a static and immobile place. Bullock carts provided short-range haulage. Some commodities were transported considerable distances on the backs of large convoys of pack animals owned by a hereditary grouping of itinerant transporters called *banjaras*, whose bullocks moved salt, sugar, corn, and rice across the subcontinent. A *banjara qafila* (caravan) often contained 10,000 or more bullocks, each laden with 250–350 pounds of goods. Journeys up to 2,000 miles were undertaken. Elsewhere, boats carried substantial cargoes along India's coastal waters, and on the great rivers when water levels made such traffic feasible.

People, too, had circulated throughout South Asia and beyond for thousands of years. The great Mughal emperors (1556–1707) along with their enormous retinues (virtually small cities on the move) of courtiers, soldiers, artisans, servants, and hangers-on moved from encampment to encampment, and from one urban palace to another. Cities as distant from one another as Agra, Delhi, and Lahore were favored by the imperial presence. Merchants and traders, government officials (previously Indian and then increasingly colonial), and soldiers criss-crossed India. Pilgrimage is important to the practice of Hinduism and Islam; hence, a great many South Asians, rich and poor alike, traveled to sacred sites. Many Moslems additionally undertook the *hajj*, the pilgrimage to Mecca. Events like the great *kumbha melas* of Hinduism—the most important and auspicious of Hinduism's religious gatherings that occur every 3 years at one of the four major pilgrimage sites—resulted in the presence of a million plus pilgrims well before railroads operated in India, but considerably more attended once transportation by train became available. Pilgrim numbers continued to increase. Seventeen million attended the *kumbha mela* at Allahabad (Prayag) in 2001, a great many arriving and departing by train.

Nonetheless, and despite all of the circulation of peoples and commodities prior to the railroad age, the steam-powered iron horse—sometimes visualized in later 19th-century Indian paintings as a horrible new kind of beast—did make a substantial difference to transportation across the extensive and

varied terrain of South Asia.[3] A transport revolution occurred: steam locomotion shattered the limitations of animate-powered means of transport. The pace of transport increased "at an unimaginable rate" in the last half of the 19th century.[4] Earlier means of animal and human transportation—pack animals, carts, palanquins, and devout pilgrims crawling along the ground, for example—had to contend with the new locomotion that triumphantly steams its way across the bottom panel in the illustration reproduced in Figure 1.1. The engine of change had arrived.

Construction of railroads in India began in 1850. Contractors' engines soon began to chuff their way along short sections of track. Construction proceeded apace and the British periodical, the *Railway Times*, reported (January 15, 1853): "In a few weeks, therefore, the iron road that is probably destined to change the habits, manners, customs, and religion of Hindoo, Parsee, and Mussulman, will commence its work in the Indian Peninsula."

Experimental and load-testing trains followed. Finally, on Saturday, April 16, 1853, the first train to run officially in India transported a large group of dignitaries along the 21 miles of track connecting Bombay (modern Mumbai) with Thana (Thane). Newspaper accounts describe a fourteen-carriage train pulled by three engines transporting some 400 people on a day designated a public holiday. Large crowds, a band, and a 21-gun salute marked the 3:30 PM departure of the train from Bombay. The arrival at Thana at 4:45 PM was followed by a great banquet and many laudatory speeches. The orators, then as in the decades ahead mainly British as line opening ceremonies followed one another in rapid succession, filled their perorations with assertive claims about how the new engines of change would bring *progress* and the advancement of what the British saw as their civilizing mission in India. The British happily embraced railed steam locomotion as a measure of a superior civilization (or so they believed) they were prepared to share with Indians. As one orator said at the Thana banquet: "a well desired system of Railways, ably and prudently executed, would be the most powerful of all worldly instruments of the advancement of civilization in every respect. . . . "

Much of the early track to Thana passed through idyllic, rural countryside (see Figure 1.2) that is now gone and engulfed in the mammoth urban sprawl of Bombay. Today, at rush periods, jam-packed, nine-carriage units follow one another at 30-second intervals through the densely built-up area to Thana and beyond. The massive alteration in the landscape of Greater Bombay between 1853 and 2006 is one example of the India the railways helped to make. The physical and social world had changed completely.

The railroads considerably increased the pace of transportation as well as vastly increased the volume of goods and passengers that could be moved across all distances. More goods and people could be transported with greater certainty and regularity regardless of the weather. Prior to the railroad age much ground transportation was severely disrupted in many

Figure 1.1
Modes of Transport in India in the Early 1860s. *Source: Illustrated London News*, September 19, 1863.

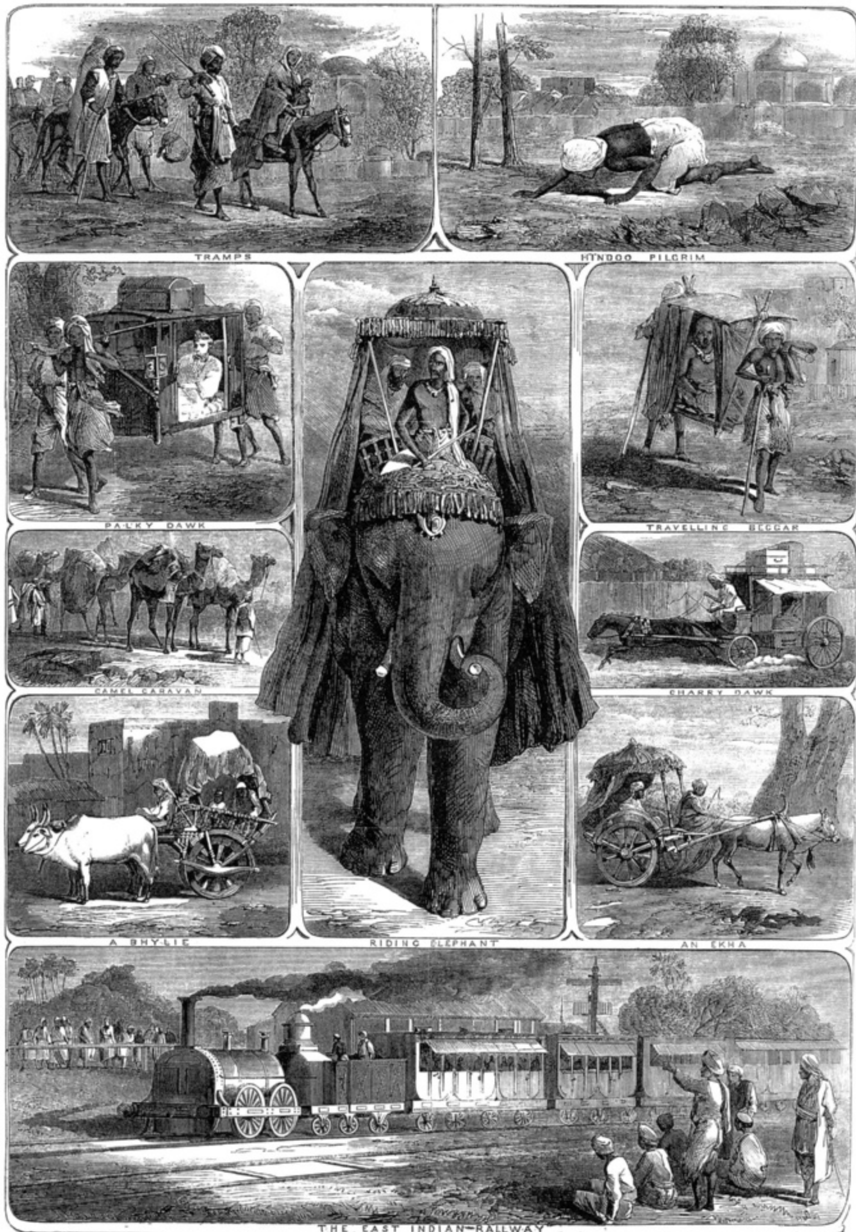
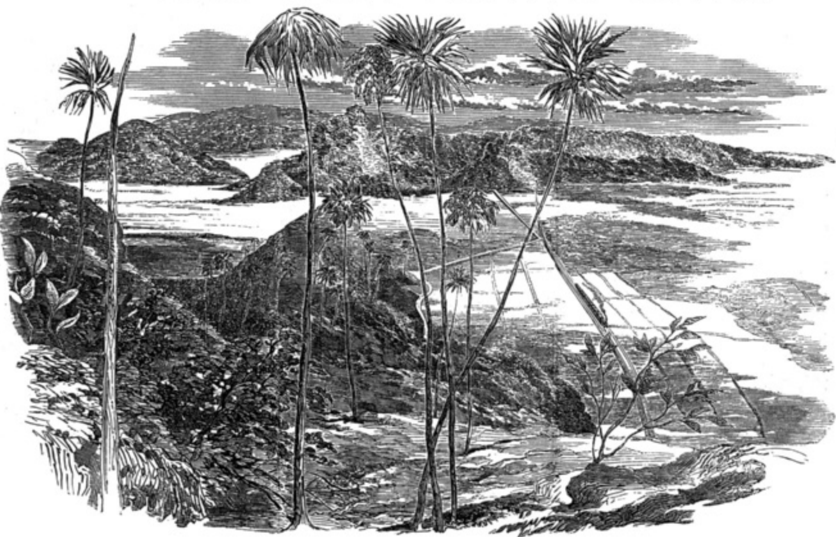


Figure 1.2
Trains in Rural Countryside Near Bombay City, Early 1850s. *Source: Illustrated London News*, July 8, 1854.

4 THE ILLUSTRATED LONDON NEWS [JULY 8, 1854.

THE GREAT INDIAN PENINSULA RAILWAY.



VIEW FROM SION HILL.—THE RAILWAY CROSSING THE MARSH

anxious to see the passing train, and all were dressed as for a holiday. Tannah once passed, the new, or extension, portion of the line commenced. The magnificent bridge, or viaduct, by which that arm of the sea called the Tannah River is passed, is upwards of a quarter of a mile long. The immense quantity of solid masonry, the iron girders, and bridge, from England, the great height of the arches—allowing of large country boats passing underneath—must give the natives of India a tolerably just idea of what English energy and English engineers can do. This bridge passed, the train leaves the Island of Salsette, and is on the mainland of India; so that from the starting point you pass from the island of Bombay to that of Salsette, and, from the latter to the mainland. About half a mile from the bridge the first tunnel is entered. It is not above three hundred yards long, but quite enough to show our Eastern fellow subjects how a railroad can overcome even the obstacle of a mountain. A little farther on is another tunnel, about double the length of the first, and solidly built with masonry, although bored as it were through the earth, not blasted out of the rock like the previous tunnel. The traveller then begins to realise in his mind—what was long thought to be an imaginary vision—namely, a railroad through the jungles of India. From Bombay to Tannah the road has been for years well known; but beyond Tannah you reach the heart of the Concan, and a scene as different to that around Bombay as the West Riding of Yorkshire is to Switzerland. Having passed the two tunnels, we come upon a regular rail-jungle, with high hills on one side of the road, and an inlet of the sea close on the other. At six o'clock precisely the train arrived at Callian, where the company found an immense suit of tents pitched, and the dinner-table laid for about 300 guests. The first move was to the top of an adjacent hill, to view the scenery, which from this point is magnificent. The high mountains, the Tannah river or creek, the line of rail winding along the foot of the former, and tents pitched on the banks of the latter, the large assemblage of the English scattered in groups over the hill above the station, and the now empty train, with its hissing, puffing engine below, altogether formed a sight which will not be forgotten by those who were present. The Railway Directors, with Major Swanson at their head, seemed to think of nothing but providing for the comfort of their guests. When the party ascended the hill, they found at the top chairs enough for all the ladies; and, when they came down again, an equal number of seats were set out by the river side. Spacious dressing tents were pitched; a large table was prepared for, and all the seats at it completely filled by, Parsee gentlemen, about forty or fifty in number, who seemed to do as much justice to the good cheer as their European friends. The Governor's band was in attendance, and played during the dinner. This portion of the entertainment being over, the speeches began; after which, the whole party adjourned to witness an exhibition of fireworks and blue-lights sent up and burst from the opposite side of the river. About a quarter past nine the guests mustered on the platform, and at a quarter to ten the train started for Bombay. On the return trip, the tunnels were lighted up with blue-lights, giving a very pleasing effect. The train made one very short stoppage at Tannah, and reached the Boree Bunder Station at eleven o'clock. The day, as well as the occasion of the entertainment, will long be remembered in Bombay; and, a year hence, may the company meet to celebrate another step in advance made by the Great Indian Peninsula Railway Company.

The opening of the first portion of the line was illustrated in our Journal for June 4, 1853.



THE BYCULLA STATION.



THE EASTERN TUNNEL.



THE FLATS, FROM SION-HILL.

areas during the marked and prolonged rainfall that is a feature of India's monsoonal climate, with its pronounced division between the wet and dry seasons. The same division affected riverine shipping because water levels varied greatly while the accompanying shifts in the prevailing wind patterns also disrupted coastal and river shipping. Railroads could be affected by the weather—flooding and track damage did occur—but such difficulties were better handled. The monsoon rains no longer crippled transportation on a regular basis.

Over time, too, the railroads came to offer a cheaper form of transportation. One economic historian estimates that in 1900 the railroads provided India with social savings of 9 percent.[5] This means it would have cost roughly Rupees (Rs.) 1.2 billion (9% of national income) more to transport the same quantity goods by the cheapest, nonrail option. Thus, Hurd argued, the railroads reduced transport costs and "brought considerable savings to the economy." However, this reduction did not take place overnight. In the late 1860s some seventy *ekkas* (one-horse carriages, see the fourth panel on the right side of Figure 1.1), each carrying three to four passengers, plied the 32-mile road between Amritsar and Lahore. Each passenger paid about one-half of the third-class railway fare—a sufficient saving for those for whom financial saving was more important than the time saved by train travel. Elsewhere, too, the triumph of railed transport took time, required network expansion, and was never as complete as the advocates of railroads expected. The engines of change followed uneven routes and variable schedules.

Indeed, if one jumps forward to the second quarter of the 20th century one finds that the railroads of India had begun to encounter competition from a new, flexible form of road transportation: trucks and busses powered by increasingly more reliable, gasoline-fueled, internal combustion engines. By the closing decades of the 20th century, trucks and busses were serious rivals of the trains for short- and medium-distance transportation.

Nonetheless, the growth of India's railroad network during and after the colonial period was impressive. India provides the preeminent example of railroad development in the world beyond Europe and North America. India's 26,955 route miles made it the world's fourth largest railroad network in 1905: a position the fully state-owned and state-operated Indian Railways (hereafter IR) retains in the early 21st century when its route mileage exceeds 39,000 (see Table 1.1).

The railroads as a material presence—a technology if you will—and as a social force were at the infrastructural core of the making of the modern Indian state and nation. The railroads influenced, directly and indirectly, much of what occurred in colonial and postcolonial India, as they did elsewhere in the 19th- and 20th-century worlds.

The reason is straightforward. The railroad was (and is) a very large-scale, sociotechnical system devoted to land transportation (other examples

Table 1.1
Operating Route Miles, 1861–2001

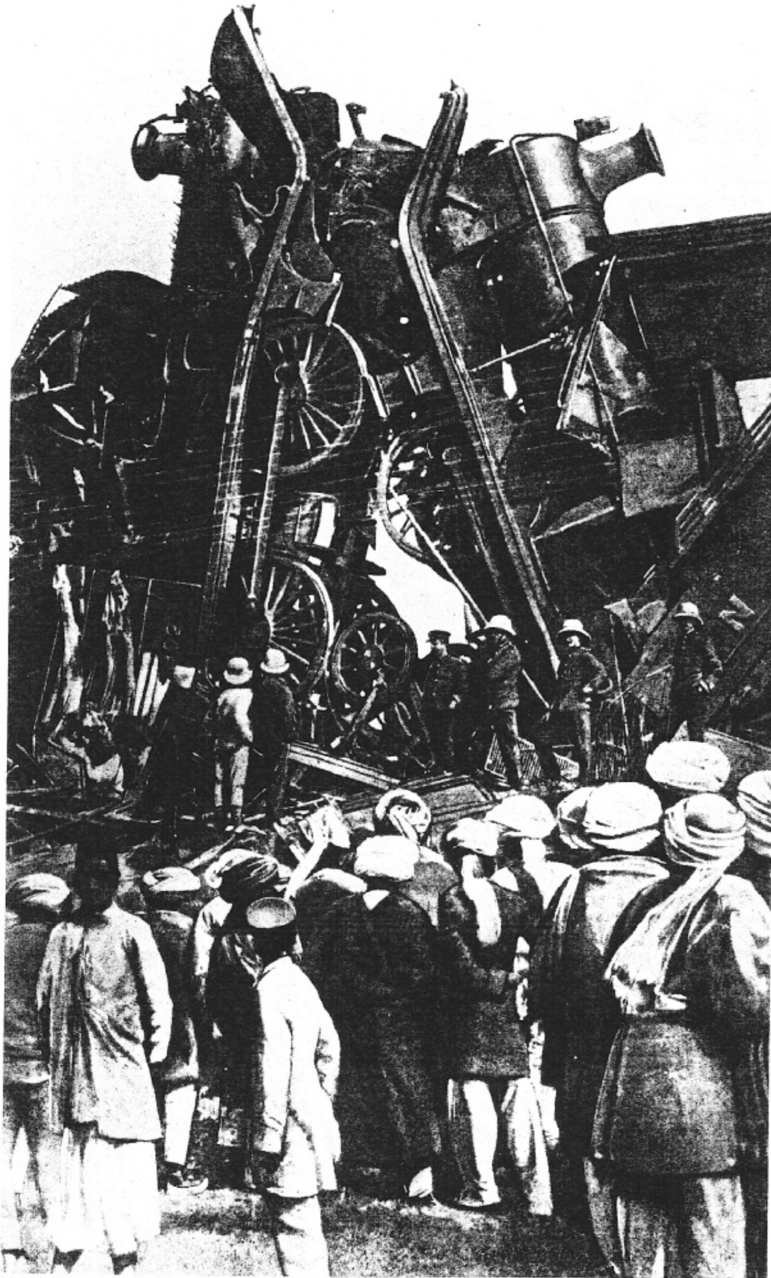
1861	1,587	
1871	5,074	
1881	9,723	
1891	16,690	
1901	24,185	
1911	31,310	
1921	35,406	
1931	40,224	
1941	41,052	
1951	33,230	(reflects the political division of 1947)
1961	34,873	
1971	37,070	
1981	37,969	
1991	38,668	
2001	39,077	

Note: This table displays the growth of the railroads in terms of route mileage for the years 1861–2001 at ten-year intervals. The statistics after 1941 apply to India only and do not include Pakistan (or subsequently Bangladesh). Prior to the independence of India in 1947 the lines were built primarily to the 5 feet 6 inch gauge and the 3 feet 3 inch gauge (often called meter gauge) with a few lines constructed to narrower gauges, most often 2 feet. In 1905 (the year used in this book to divide Chapters 4 and 5), 14,477 miles were of the 5 feet 6 inch gauge and 11,421 meter gauge. Maps 4 to 7 display the operating routes as they existed at a selection of dates.

of large-scale technical systems include networks for the production and distribution of electricity, telegraph systems, and telephone systems be they wired or wireless) throughout South Asia. Within large-scale technical systems institutional arrangements are as important as artifacts and machines, managerial skills are as important as technical knowledge. The physical structures and complex machineries of the railroads and their many employees had to be integrated into an operational whole over large spans of space and time. Integration, timely information, coordination, and precise execution are crucial to railroad operation. Consider with the help of Figure 1.3 what happens when timely coordination does not occur and two converging trains meet on the same track. The carnage could be huge.

In 19th-century India, the railroads used British-derived organizational models, British managers, engineers, foremen, and skilled workmen, and British machinery to pioneer the area of private, large-scale organizations.

Figure 1.3
Train Crash, Punjab, 1907. *Source: Illustrated London News*, February 8, 1908.



These railroads directed and coordinated large numbers of Indian employees, work practices, and many types of equipment spread over extensive distances. Compared to the United States, private railroad companies in India experienced more government control, did not own the right-of-way along which their tracks ran, and had less influence on the organization of other large-scale businesses. And, as the story unfolded, government in India soon started a system of state-owned and state-run railroads.

Railroad technology in colonial India must be viewed in its social and physical dimensions.[6] Crucially, knowledge was transferred. This knowledge existed in a multiplicity of forms from the very abstract to the very specific; from the vision of a railroad system to an operating railroad; from the design of a bridge to the construction of that bridge; from what might be called applied science, in which knowledge derived from physics and chemistry reduced to mathematical formulae enabled engineers to calculate stress levels for iron railway bridges, to the personal skills and tools an individual worker needed to rivet that same bridge or, unknowingly, to apply the laws of thermodynamics such that a driver and a fireman operated a steam locomotive. Also crucial were the clerical arrangements that made it possible to issue a ticket in Bombay for travel to Delhi via Calcutta such that the ticket and the reservation made in Bombay was honored a month later when the traveler left Calcutta on a Delhi-bound train.

Thus, knowledge and skills and organizational forms were as much a part of India's railroad history as the physical technology of engines, rails, bridges, signals, etc. Technology always has its material and social dimensions; people make history, not machines.

The railroads facilitated, linked, and coordinated a wide variety of socioeconomic processes and cooperated with other large-scale transportation and communication systems. For example, the railroads enabled national markets with converging prices for food grains to emerge in the 1880s; the same railroads made it possible for peasant villagers to undertake quick pilgrimages (within a few days or less) during their brief respites from the demands of agriculture. The hard backbone of British colonial rule in India, the British soldier and his weaponry, could be quartered in fewer places in the knowledge that the railroads could transport troops rapidly to trouble spots. The publications of what became the outpourings of many presses owned by Indians and printed in Indian languages and in English found profitable markets. The railroads synergistically cooperating with the post office facilitated the inexpensive, bulk shipments of books, magazines, and newspapers, among which many came to have nationalist orientations.

In short, as many have argued, time was compressed: transport for people or commodities that previously required weeks was reduced to days. Therefore, space was also seen to be compressed since, for example, Calcutta was no longer considered to be a long, arduous distance from Bombay. One

authority writing in 1894 said that because of the railroads India had effectively been reduced in size to "one-twentieth of its former dimensions."[7] Places 400 miles apart previously requiring weeks of fatiguing travel became, in effect, 80 miles apart: travel that once required the better part of a month could be undertaken easily and economically within 24 hours or less. India could begin to be more readily imagined as a single entity. Madhav Rao's expectations for the unifying effects of the railroads began to materialize.

"Coordination across time," argues Anthony Giddens, "is the basis for the control of space."[8] Time, finely graded and precisely used, is central to railroading. The railroads coordinated a whole range of activities across time and thus provided a basis for the improved control of space. The colonial authorities understood this right from the start. Later, Indian nationalists came to a similar understanding. In 1921, Gandhi wrote in *Hind Swaraj or Indian Home Rule*: "It must be manifest to you that, but for the railways, the English could not have such a hold on India as they have."[9]

A humble example, repeated many times over the years and decades from 1853 forward, illustrates well how temporal coordination affected spatial arrangements. The widowed Mrs. Rupa Mehra, a central figure in Vikram Seth's great 1990s novel *A Suitable Boy*, wrote by postal mail (carried by train) or sometimes by telegram to and from the houses of her married children in different parts of India. The letters announced she had purchased tickets on a certain train in order to visit the recipient of the letter. Domestic arrangements at one end were terminated by the train schedule, a train carrying Mrs. Mehra would arrive in a distant city at a scheduled time, and her new living arrangements would begin. The train facilitated and coordinated her movements.

The preceding discussion provides concepts and themes through which we can better understand the fascinating story of the railroads and the making of modern India. We can use an expansive concept of railroads as a large-scale sociotechnical system. It suggested that the construction and operation of the railroads relates crucially to the making and remaking of India's social space and physical space; in short to the mastery of space through the restructuring, the compression of time, or what Marx and other mid-19th-century writers called "the annihilation of space through time."[10]

We have also suggested that until 1947 Indian railroads were colonial railroads, another central theme. British rule in South Asia fostered the early development of railroads but it was a development skewed to the political, administrative, military, and economic needs of the Anglo-Indian connection. How this played out between 1850 and 1947 is central to the story told in the pages ahead. The spatiotemporal-social making of modern India was influenced strongly by the fact of colonial rule. As far as the railroads were concerned British rule meant, among many other things, that

Britons dominated the senior levels of railroad service until 1947. This means additionally that another important theme, the contributions of the railroads to the building of the Indian state and nation after 1947, was colored by the fact that independent India inherited railroads built and operated to serve colonial purposes.

The postcolonial character of independent India's railroads was reduced more slowly in some respects than in others. Thorough Indianization of the senior levels of the officer cadre occurred quickly. IR became subjected to new pressures, as powerful politicians demanded new lines (or opposed closing of existing lines), new stations, new administrative divisions within IR, and other concessions great and small. But, regardless of the merits of these political demands, they did represent the important transition from colonial authority with its agendas and pressures, to the voices of elected members of the national and state legislative bodies.

On the physical side, independent India quickly established a large-scale locomotive manufactory ending a long-term dependence on British-built locomotives. However, the basic physical infrastructure—most notably the routes of the permanent way—represented a different problem. The colonial railroads became a deeply imbedded presence in India's rural and urban landscapes. They became imbedded quite literally as tens of thousands of miles of well-ballasted steel rails, but they also became imbedded financially as the result of large amounts of capital expenditure. Once the basic network of lines was emplaced it could only be changed at great physical and financial cost. Thus, almost paradoxically, the engines of change constrained or channeled further development.[11]

The railroads changed much and then made subsequent change difficult although not impossible. The built environment became one of the spatial conditions inherited from the past which weighed on the ability of postcolonial Indians to make their own history. Spatially imbedded survivals from the past assume temporal causality, hence, in one sense, post-1947 India has had to accept the continued presence of a "colonial" railroad system. Nonetheless, IR has done what it can. Completely new lines have been built since 1947 and, to tinker with one of the colonial legacies, an aggressive yet expensive program to convert meter gauge lines to the 5 feet 6 inch gauge has been undertaken. But how does one easily change an existing system of railroad lines in a massively built-up urban area like Greater Bombay?

To write about the making of the postcolonial Indian state and nation necessarily introduces the book's final theme, namely the roles the railroads played in the colonial period in fostering and supporting the growth of Indian nationalisms and the movements for independence—the plural being most appropriate since these movements were never monolithically homogeneous and, in the event, also came to include the demand for a separate country, Pakistan, for Moslems.[12] Something of these developments were hinted at

Figure 1.4
Postal Cover, 1953, Celebrating the Centenary of Railroad Operations in India. *Source:* Author's personal collection.



in the quotation from Madhav Rao but the theme needs to be pursued explicitly as a set of processes closely related to, but separate from, the mastery of time and space and colonial rule. Indeed, with respect to colonial rule, the railroads strengthened the colonial state, yet facilitated the growth of anticolonial nationalism(s); the colonial state strengthened and better integrated by the railroads in turn provided the administrative basis for post-1947 independent India, and, less effectively, for Pakistan.

The passengers on the inaugural train from Bombay to Thana in April 1853 knew they were participants in an important departure in the history of the Indian subcontinent. They could not foresee all the many changes the new engines would help to bring about but they understood that a new era, a railroad age, had begun. Karl Marx, observing this momentous development from afar and writing in the New York *Daily Tribune* on August 8, 1853, stated that the British would establish a "net of railroads over India" and the "results must be inappreciable."[13] Not all the results that Marx prophesized occurred—interestingly he misunderstood the retardative power of colonialism—but in 1953 the citizens of the Republic of India celebrated the centenary of rail travel in South Asia. Events, books, and postage covers recognized the special role of the railroads in the making of modern India. In Figure 1.4 we see a postal cover from 1953 where progress was celebrated in the move from the old locomotive to the sleek

locomotive at the bottom of the image.[14] As we scan downwards we move through time; we move through the 100 years emblazoned in the middle of the image. The stamp cover encouraged Indians to celebrate their railroad past, their railroad present, and the contributions of the railroads to their national life. How India's encounter with railroads began in the period ca. 1850 to ca. 1870 is examined in the next chapter.

CHAPTER 2

The Pioneering Decades, ca. 1853 to ca. 1870

Railroads for India were proposed initially in the mid-1830s. Fifteen years of promotion and debate ensued until key decisions in favor of the Great Indian Peninsula Railway (hereafter GIPR) and the East Indian Railway (hereafter EIR) were made in March 1849. Thus, finally, railroad building in Britain's largest imperial possession began in 1850. The ceremonial turning of the first sod for the GIPR occurred at Bombay on October 31, 1850. Work on what became the main railroad in Bengal and in the Gangetic Valley, the EIR, began near Calcutta in 1851.

In 1853, the governor-general of India, Lord Dalhousie (in office 1848–1856) laid out a comprehensive plan for the development of the trunk lines. The capable, hard-working, and assertive Dalhousie was a committed technological modernizer. His political responsibilities before he went to India had made him familiar with British railroads. Dalhousie later claimed he had unleashed in India the "great engines of social improvement, which the sagacity and science of recent times had previously given to Western nations—I mean Railways, uniform Postage, and the Electric Telegraph."[1]

Dalhousie's Template and the Start of Construction

Dalhousie's influential, lengthy (216 pages handwritten in a sprawling, bold hand) memorandum—a "minute" in the language of the day—deserves close study.[2] It provided justifications and guidelines for the system of railroads that was developed in South Asia under British auspices in the third quarter of the 19th century. The governor-general emphasized the political and military benefits railroads would provide. "Immeasurable" advantages would

accrue to a colonial administration composed of a "comparative handful" of British administrators and soldiers scattered over the subcontinent. Railroads would enable Britain "to bring the main bulk of its military strength to bear upon any given point in as many days as it would now require months, and to an extent which at present is physically impossible."

Dalhousie also noted the "commercial and social advantages" of railroads. These advantages included an increase in trade between India and Britain: more Indian "produce," including raw cotton, would be transported to Britain, and more manufactured British goods would be sold in India. Railroads would encourage enterprise, multiply production, facilitate the discovery of latent resources, increase national wealth, and encourage "progress in social improvement" similar to that which occurred in Europe and the United States of America.

The hardheaded Dalhousie stressed the political, military, and economic benefits accruing largely to Britain, to the Anglo-Indian connection, and to the colonial regime. He sought to influence calculating decision makers in London: his political masters, and also potential British investors from whom the bulk of the financing for India's railroads had to be obtained.

Thus, in the 1850s and for many decades, India's railroads were conceived and executed as a colonial project. British authorities, with little input from Indians, decided when and where lines would be built—and a good deal more. India's railroads were meant to serve British interests first and foremost, among which military and administrative security and economic benefits were central. The interests of Indians were incidental although, as represented in the writings of Dalhousie and many Britons, the progressive consequences for India of the railroads was a self-evident truth: an assertion accepted then as later by many Indians even though Gandhi wrote in *Hind Swaraj* (1921) about the railroads' contribution to the British control of India. Gandhi, in fact, went further. He denounced railroads as "evil" since "good travels at a snail's pace."

Gandhi was a central figure in the Indian struggle for independence from 1919 to his assassination in 1948. His views on railroads, however, were not widely accepted—and he himself used railroads to travel across India in the nationalist cause. Most nationalists' denunciation of the railroads came to focus on the ways in which the system operated and on the British dominance of the upper echelons of the workforce: railroads per se and their progressive presence were not questioned. More typical of Indian views held in the 1870s (and in the 1970s) were those of Framjee Vicajee who published a forty-four page pamphlet titled *Political and Social Effects of Railways in India* (1875). The pamphlet praised the many interconnected, progressive changes railroads had set in motion across South Asia, "the great economical and social changes, due partly to railways and partly to other instruments of civilization" through which India was "silently passing."[3]

The template Dalhousie established in 1853 called for a system of great trunk lines best suited (1) to "maximize political and commercial advantages" along (2) specific routes providing favorable engineering conditions and (3) well situated for the subsequent construction of subordinate lines. Firstly, Dalhousie advocated a line over 1,500 miles long heading north from Calcutta, and then northwest up the Gangetic valley to Allahabad, and beyond: to Delhi, and then deep into Punjab to Lahore, and onward to the Jhelum River. Secondly, he recommended two lines out of Bombay: one line in a northeasterly direction to tap cotton growing tracts in western India and to link up with the line in the Ganges valley, thus effectuating a through connection between Bombay and Calcutta; a second line to Poona and onward to the southeast to join up with a line built in a northwest direction from Madras. The latter junction required construction through the largest of the princely states (see Chapter 1 and Map 1) ruled by the Nizam of Hyderabad, of whom, Dalhousie wrote, he "is a foreign potentate, but wholly helpless in our hands." Thirdly, then, Dalhousie recommended the lines to be built outward from Madras. These were the northwest line just mentioned, and a line to the south, and then west through Coimbatore, and on to the west coast with a branch line to Bangalore (site of an important cantonment of British troops).

These lines (indeed for all lines it was initially expected) were to be built to the 5 feet 6 inch gauge. This dimension had been established earlier when construction of the initial, short, experimental lines near Calcutta and Bombay (e.g., the Bombay–Thana line) had been approved. In a minute by Dalhousie dated July 4, 1850, he had shown himself keenly aware of the gauge controversy in Britain (the more extensively used 4 feet 8½ inch versus the 7 feet gauge of Brunel's Great Western Railway) and had argued for a 6 feet gauge for India. The decision to settle upon the 5 feet 6 inch gauge was made in London and appears to have been a compromise decision—closer to the most used British gauge but nonetheless wider to satisfy those who believed 4 feet 8½ inches to be too narrow. Trunk lines, moreover, were to be built to the specifications needed to handle double tracks (e.g., wider and stronger bridges) even when, at first, a single track was installed.

Following clarifying exchanges between Calcutta and London extending into October of 1853, these and other important recommendations contained in the 1853 minute were approved by the authorities in London. Important among Dalhousie's many other recommendations (some of which were technical points) was his argument for the construction and operation of India's railroads by private companies "formed in and directed from England" under the general control of the Government of India (GOI). These "private, guaranteed companies" provided the mechanisms through which largely British capital built, managed, and operated almost all the railroads of the pioneering decades.

Policies and regulations were in place. Railroad construction in India could begin in earnest.[4] Map 4 provides a graphic demonstration of how closely Dalhousie's plan was followed and how tightly the blueprint reflected the imperatives of the colonial connection. Thus, in 1871 route miles totaled 5,074 and running miles reached 5,795 as double-tracking began to be installed. Dalhousie's system of trunk lines approached completion although he was not around to see his plans realized. Not even 50 years old but worn out from his exertions in India, Dalhousie had died in 1860.

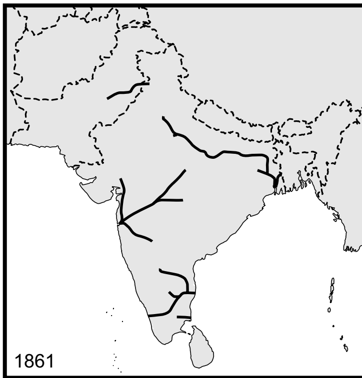
Lines were built outward from the great port cities and major centers of colonial administration, Calcutta, Bombay, and Madras, which then were connected with one another via railroad lines. Security and commercial benefit meshed nicely as those three "head-link" cities provided the physical interfaces between all aspects of the Anglo-Indian connection at the junction point of two steam technologies: steamships and railroads. Map 4 also depicts the beginnings of railed transportation out of the then small port of Karachi—today Pakistan's largest city. Look, too, at northwestern India, at Punjab, where the lines reflected the British concern for the security of the turbulent northwestern frontiers of India—the 21st-century borderlands between Pakistan and Afghanistan. Add a decade and the completion of lines planned or underway in 1871, and one gets the impressive network of trunk lines opened by 1881.

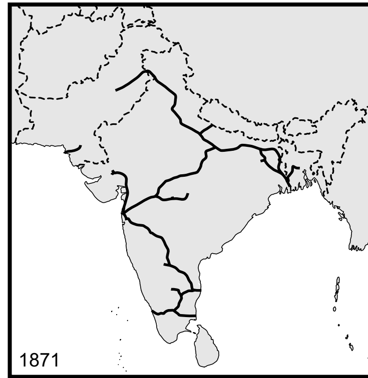
The period from the earlier 1850s to the early 1870s, encompassed the pioneering two decades of railway building and operation in India. It was, in the words of one writer, a period of great accomplishment, "romance and excitement" over which historians can justifiably linger.[5] Many difficulties and hardships had to be overcome; many lessons, some involving considerable human or financial cost, had to be learned; triumphs great and small, and tragedies with general consequences and/or individual loss occurred often. Great bridges were built and some fell down; thousands of construction workers died within days as gusts of epidemic diseases hit the assembled workforces; a young child laboring alongside his or her parents died because of an accident. Nonetheless, the engineers, contractors, colonial officials, skilled workers, and huge numbers of coolie laborers pressed on.

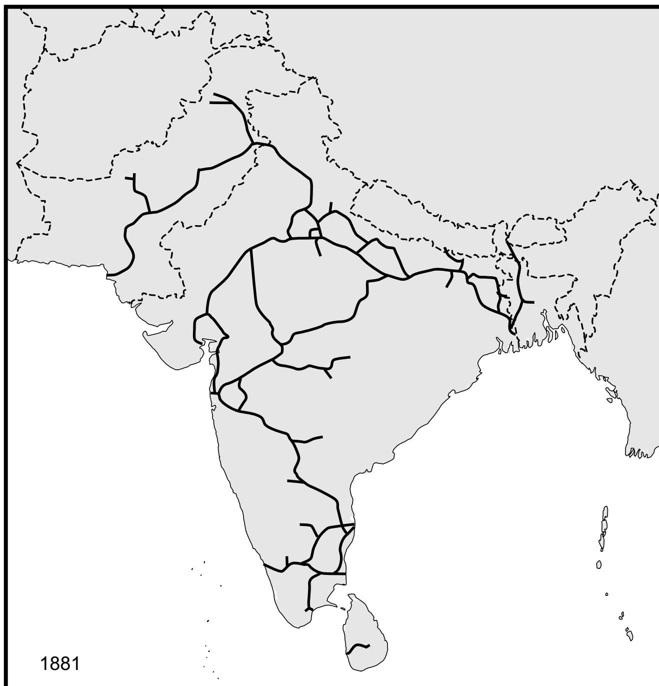
1857: Mutinies and Civil Uprisings

The pioneering period of railroad building was also marked by a defining event in the political history of modern India known as the "First Indian War of National Independence," the "Rebellion of 1857," the "Sepoy Revolt," the "Indian Mutiny," and sometimes simply "1857." Each label captures a different perspective on the events and their significance. The British lost control of much of north and central India outside of a few tenuously

Map 4
Railroad Routes in 1861, 1871, and 1881.







held cities and major lines of communication. However, most other areas including the great port cities and administrative centers of Bombay, Madras, and Calcutta, remained peaceful and under British control. A good deal of violence ensued but, with what sometimes was the application of draconian

force, the British suppressed the uprising. By March of 1858 the insurgency had effectively ended although pockets of resistance remained into 1859–1860.

The events of 1857 affected Anglo-Indian relations for decades and were never completely resolved. Two developments significantly affected the railroads. The first was the abolition of the English East India Company (EIC). Founded in 1600 as a royally chartered joint-stock company engaged in trade, it eventually became a quasi-private organization with governmental responsibilities. The EIC, itself increasingly brought under the control of the British government, had gradually brought India under British rule. The Crown took direct control of India in 1858 with the governor-general, now styled viceroy, as the legate of the British monarch, reporting directly to the secretary of state for India. The latter was a member of the British cabinet, hence a political figure of some stature. The Crown assumed the rights and responsibilities set forth in the contracts between the EIC and the railroad companies but relationships were now more clear: the EIC as an intermediary organization with rights and interests of its own had gone.

The second set of effects was felt on the ground. Railroad construction in many parts of the Gangetic valley came to a halt. Partially completed works were destroyed and workers dispersed. British engineers and overseers fled to points of refuge; some were forced to defend themselves; a few were killed. Construction schedules set back by at least 12 months incurred substantial, additional costs. The uprisings further convinced the GOI of the advantages railroads offered to the colonial power, and the need to push ahead rapidly with construction. The authorities had seen how the lines that were open had facilitated troop movements, and they recognized that had more lines been available the 1857 mutinies and civil disturbances might have been more quickly suppressed.

In many ways, Gandhi was right: the railroads became a potent weapon of colonial control. The railroad tie, a sleeper to the British, held the rails securely to the earth of mother India; the rails and their engines of change bound India together, strengthened British control, and tied India more closely to Britain.

Obstacles: Difficult Terrain, Rivers, and Diseases

India's diverse and often rugged landscape presented formidable challenges to the railway engineers, contractors, and workers. The railroad builders encountered a particularly difficult problem near Bombay. Precisely where, it had long been debated, could the lines northeast and southeast from Bombay best surmount the formidable mountain range known as the Western Ghats that run parallel to India's west coast at distances roughly 20–50 miles inland (see Map 3). The Ghats are not very high—roughly 2,000 feet to the

crest in the areas east of Bombay and somewhat higher further south—but they do rise abruptly and ruggedly beyond the narrow coastal lowlands. Some experts thought the Ghats could not be conquered by lines built to gradients within the capacities of the steam locomotives of the day; others argued over the merits of particular routes through the precipitous terrain. Dalhousie did not answer this thorny question in 1853 and, instead, required additional study. It took a couple more years of arduous surveying before construction of railroad inclines at the Thal (northeast) and Bhore Ghat (southeast) received approval.

More generally, mountains and deeply incised hilly areas, deserts, extensive jungle tracts, great rivers prone to widespread flooding, and the lush complexities of southern and eastern India's paddy-field-dotted terrain taxed the skills of the surveyors and builders. Even where it was flat, as in extended parts of the Gangetic valley, the construction of embankments and a permanent way raised above flood-prone sections was often required. The pronounced alteration in most parts of South Asia between wet and dry seasons created additional problems. Great rivers in wide, sandy beds were little more than streams for part of the year but became deep, mile-wide, channel-shifting, high-velocity flows after the rainy season.

And, of course, for decades the construction of India's railroads took place within a medical context where little was known about the etiology, epidemiology, and treatment of certain virulent diseases capable of killing large numbers of people in epidemic outbreaks. Cholera was the most frequent and rapidly acting among the mass killers, although pneumonia, typhoid, smallpox, kala-azar (blackwater fever), and other diseases also ravaged the construction workers. More insidious and slower acting but no less deadly was malaria: an endemic presence in much of India that was capable of achieving epidemic proportions when conditions favored the multiplication of mosquitoes. One terrified surveyor working on the Ghat sections of Travancore Railway Survey in the early 1880s wrote to his superior that "fever and wild beasts" made his work "really dangerous, and should anything happen to me, I think in justice the Company should support those I leave behind, viz., my wife and children."[6] By the early 20th century epidemiologists were writing about "tropical agglomerations of labour" where the massing of large numbers of workers in difficult and often unsanitary conditions created situations favorable to the growth and spread of deadly microorganisms.

Nonetheless, the railroads were built. In 1861, 1,587 route miles of track were in operation and an additional 1,295 were under construction. The comparable figures in 1871 were 5,074 and 775. Estimates suggest that over a quarter of a million people were involved in railway construction in South Asia in 1861 with the total for the last half of the 19th century exceeding 10 million.[7] Construction was the heroic and compelling story in the early decades. Moreover, the construction process had its own important social,

Table 2.1
Growth of the Private, Guaranteed Railroads, 1853–1871

Private Guaranteed Companies	First Operational Year	Miles Opened in First Year	Miles Opened by End of 1871
Great Indian Peninsula	1853	21	1,273
East Indian	1854	38	1,503
Madras	1856	65	830
Bombay, Baroda, and Central India	1860	35	341
Sind, Punjab, and Delhi	1861	110	554
South Indian	1861	49	186
Eastern Bengal	1862	110	157
Oudh and Rohilkand	1867	42	42

economic, and physical consequences for South Asia. Chapter 3 discusses construction in greater detail.

The Private, Guaranteed Railroad Companies and the Government

Railroad construction provided India with operating railroads. The short line from Bombay to Thana was soon joined by other short stretches, and those short lines were soon extended and joined to one another. Networks emerged. By 1871 the railroads had made a substantial impression on India and had become a prominent, new feature on the maps of the subcontinent. But their impression went far beyond cartographic representation. In the reporting year 1871, India's railroads employed 68,517 permanent employees, transported 19,283,000 passengers, and carried 3,542,000 net tons of goods. The railroads that reshaped India's landscapes also had considerable effects on India's society and economy.

Table 2.1 details the growth of the private railroads to 1871. Each row represents one private railroad company headquartered in London. Each had a British board of directors, and each was financed overwhelmingly by capital raised in Britain. Indian investors contributed about 1 percent of the total, although there were no direct impediments to their participation.[8] Most wealthy Indians, faced with novel railroad ventures, made the rational choice to invest their money in familiar opportunities. British investment in the private railroads of India totaled some 150 million pounds in the 19th century, of which some 95 million was raised by 1875.

As part of the contract negotiations between the EIR, the GIPR, and the EIC in late 1848 and early 1849 a guarantee, secured against the revenues of the GOI, assured the railroad investor a 5 percent return on capital whether the company made money or not.[9] Hence, these companies are usually known as private guaranteed companies. A guarantee was held to be essential to raise the needed capital and, though the percentage varied, remained a feature of most contracts between the GOI and private railroad companies for the remainder of the 19th century. Guarantees were not unique to India. They were present in railroad ventures in other parts of the world where, as in India, guarantees supported "private enterprise at public risk."[10]

The private guaranteed companies had a complicated and uneasy relationship with the colonial authorities. Precisely because of the guarantees governing authority—after 1858 direct Crown authority—had insisted on a significant supervisory role for government in the construction and operation of India's railroads. Thus, the significant presence of the GOI—as a guarantor and later as proprietor, partner, and owner/manager—was an important characteristic of India's railroad history from the start. The increasing role of government culminated in the massive, state-owned and state-run system that is modern day Indian Railways (IR): a system well developed by the 1920s but not fully completed until independence.

The detailed contracts (transferred to the Crown in 1858) between the EIC, the EIR, and the GIPR—and subsequent companies—specified the powers of control and supervision government obtained as its *quid pro quo* for the guarantee: the guarantee which the Viceroy Lord Canning in 1858 described as "a species of equivalent tendered by Government in purchase of that direct control which it is so important to maintain over these great undertakings." Government had the right to determine routes. Officers and employees of the railroad companies were to be subjected "in all things" "to the superintendence and control of the East India Company."[11]

Additionally, government had the right of access to virtually all of the accounts, proceedings, minutes, papers, etc. of the railway companies and to appoint, ex officio, a member of each Railway Company's Board with "a right of veto in all proceedings whatsoever, at Boards of the said Directors." Soon, one individual came to serve as the "Government Director" on all of the individual boards of the guaranteed companies. Sir Juland Danvers served in that capacity from 1861 to 1892. His ex officio powers and his long service made him an important player in India's 19th-century railroad history. His little book (60 pages) published in London in 1877, *Indian Railways: Their Past History, Present Condition, and Future Prospects*, is as important for who wrote it, as it is for its content. He had no reservations about the benefits of railed transportation. He wrote (p. 5): "It may be laid down as an axiom that the nation which has been best provided with the most suitable means of conveyance, within and without its territory, has made the greatest advance in civilisation and prosperity."

In short, these and other clauses in the foundational contracts gave the GOI extensive powers over many aspects of railroad planning, construction, and operation. One measure of government's role is the voluminous body of railroad-related records one finds in the colonial archives, of which a substantial portion remain extant in the Oriental and India Office Collections of the British Library (hereafter OIOC) in London and the National Archives of India, New Delhi. The same records testify to just how colonial the railroads of India were: the decision makers were British regardless of whether they were politicians, government officials, or the senior staff of the private companies.

Despite the extensive powers—often exercised in detailed ways—other clauses in the contracts and other features of the situation worked directly against one of the central goals of government supervision, namely economy of construction.[12] At £18,000 per mile average cost the railroads built in India in the 1850s and 1860s were costly. Sir Charles Trevelyan, the governor (1859–1860) of the Madras Presidency called them the "gift of an elephant" which was exhausting India's resources and "eating us out of house and home." The guaranteed companies, moreover, had no land assembly costs and small legal costs because government provided the right-of-way.[13] Ineffectual cost control notwithstanding, government supervision made the colonial authorities and their procedures a central part of India's early railroad history. The government was involved in what was built, when and where it was built, the determination that a particular line was fit to be opened for traffic, and subsequent decisions about what could or could not be charged to capital, and thus be eligible for the guarantee.

The railroads listed in Table 2.1 had many layers of supervision and management, not to mention interested parties: in London, parliamentary interests and oversight, the secretary of state for India and his impressive cadre of permanent officials working at the India Office, and the Boards of Direction and the headquarters' staffs of the companies; in India, the GOI with its officials and consulting engineers, replicated in part at the level of the presidencies and provinces. Additionally, each company had a chief executive officer in India, usually styled "Agent," responsible to his board in London but with reporting responsibilities to the GOI or to lower-level jurisdictions. A chief engineer, reporting to the agent, had charge of construction and operation and he, in turn, was soon joined by other senior engineers reporting to him as heads of departments, for example, the locomotive superintendent, the traffic manager, and a civil engineer responsible for construction and permanent way repair and maintenance.

The chain of command via the departmental system of organization extended down through layers of men recruited in Britain: mid-level and junior engineers, senior accountants, shop foremen and overseers, station masters at large stations, locomotive drivers, guards, and some skilled workmen in the locomotive and carriage shops.[14] Roughly 4 percent—some

3,000 men—of the employees of the operating railroads (which did not include many engaged in construction work) in 1871 were British with another 2,000 or so being Eurasian (India-born men with British fathers and Indian mothers).[15] These men occupied the top positions within the operating railroad workforce which, then as later, was overwhelmingly (90% or more) Indian.

The Colonial Connection: Dependence on Britain

Practices and procedures in the traffic and mechanical engineering departments —including detailed rule books for the employees—were modeled on those used on British railroads. Machinery for shops, steam locomotives, metal work, and wheel units for carriages and wagons, signaling equipment, and many other pieces of equipment likewise were imported from Britain. The impress of colonialism was found throughout India's railroads to the benefit of many British firms.

Thanks to the detailed research of Hugh Hughes we know that throughout the colonial period 91 percent of the broad gauge and 77 percent of the meter gauge locomotives used in India came from Britain. A few locomotives came from European, American, and Canadian manufacturers. Only 2.75 percent of the broad gauge locomotives and 11 percent of the meter gauge locomotives were made in India prior to 1948. Hughes' four volumes provide information about virtually every locomotive that operated in India through 1990: the operating company, the locomotive classification, its maker, maker's serial number, date of manufacture, and a wealth of other detail plus many photographs.[16] Colonial India was a captive market for British-made engines.

At the end of 1869, 1,045 British steam locomotives were in main-line operation in India.[17] Most were six-wheel engines (the 473 configured 2-4-0 being most numerous) similar to those in use in England. The initial fifty 2-4-0s for the EIR were built to specifications and drawings of Robert Sinclair, locomotive superintendent of what became England's Great Eastern Railway. Sinclair kept an eye on the construction of the fifty engines and received 20 pounds per engine from the EIR for his inspections. A few photographs of Indian locomotives of various dates are reproduced among the illustrations presented in this book.

Despite the close technical, managerial, financial, and staffing connections between India's pioneering private guaranteed railroads and British technologies, practices, and personnel all did not go smoothly. Friction between the companies' engineers and government officials led to an important Parliamentary Select Committee on East India, Railways (cmd. 416, 1857–1858) to enquire into the causes of what were perceived to be delays in building and opening lines. The 1857–1858 committee found some

encumbrances to railroad development and recommended that government officials perform their supervisory role in a less bureaucratic fashion. The public airing of complaints led many involved to develop more amicable working relationships. Nonetheless, there were to be many occasions between 1857 and the mid 1930s when parliamentary committees and commissions undertook important probes into aspects of Indian railroad policy and practice, and subsequently made influential recommendations. The government of independent India after 1947 also established many influential enquiries into railroad matters.

Mismanagement, Malfeasance, and Many Mistakes

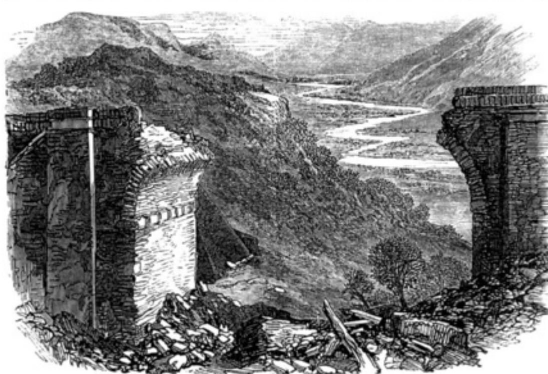
Government officials in the pioneering period had good reason to be concerned with some aspects of the construction and operation of the railroads. One member of the governor-general's Executive Council (General Mansfield, the commander-in-chief of the army) wrote in a minute dated November 2, 1867, that when he, Mansfield, "was in Bombay Presidency, I used to hear a great deal of this bad scamping work . . ."[18] All of this was discussed at the highest levels of the GOI because by the late 1860s over 2,000 GIPR bridges, buildings, and other masonry structures had failed amidst accusations that some of the original work had been of poor quality. The collapse of the Mhow-ki-Mullee Viaduct (see Figure 2.1 and further description in Chapter 3) on July 19, 1867, was the most spectacular example although good luck resulted in no casualties.

The EIR under its promoter and then managing director, Sir Rowland Macdonald Stephenson (1808–1895, knighted 1856 for his work on the EIR), was reasonably well run. Possibly Stephenson ran a careful and competent organization because he was mindful of the ill repute his father had brought to the family name. Rowland Stephenson (1782–1856), art collector and Member of Parliament fled to Savannah, Georgia in 1826 after his profligate behavior contributed to his bankruptcy and to that of the banking partnership he had inherited from his father. Detained in a debtors' prison in New York the elder Stephenson successfully resisted British attempts to extradite him and, freed from jail, lived out his life in Pennsylvania. However, his considerable property in England was seized and auctioned off.

Well-run, however, was not an adjective that could be applied to the management of the Sind, Punjab, and Delhi Railway (hereafter the SP&DR). Mistakes, mismanagement, and outright malfeasance characterized the pioneering decades of this line whose territory extended from Lahore southwest to Multan and then southward down the valley of the mighty Indus River to the port of Karachi, and southeast from Lahore to Delhi. Built and initially operated as two railroads, in Punjab and Sind respectively, each with its own agent and chief engineer (CE), the SP&DR had one Board of Direction

Figure 2.1
Collapsed Mhow-ki-Mullee Viaduct, Bhore Ghat Incline, 1867. *Source: Illustrated London News*, September 21, 1867.

FALL OF A VIADUCT ON THE GREAT INDIAN PENINSULAR RAILWAY.



BROKEN VIADUCT ON THE BHORE GHAUT INCLINE TWO DAYS AFTER ITS FALL.

Another fall of a viaduct on the Great Indian Peninsular Railway has taken place, following the terrible disaster of June 26, when seven carriages of a passenger-train were thrown into a chasm twenty feet deep, caused by the breaking down of a bridge between Bhosawul and Khundwah, in the Taptee Valley line, and a score or more of the passengers were killed. On the present occasion no lives were lost, the viaduct being actually seen to fall by the driver and fireman of an approaching train, which they were fortunately enabled to stop before it reached the precipice. There would not have been time to do so if the train had been descending instead of ascending the incline. Another train, full of coolie passengers, had passed over the viaduct just before. The scene of this break-down, which is the subject of two of our Illustrations, is the Kummalee Viaduct, crossing the Mhow-ke-Mullee Khind, between Wonee and Thakoorwada, on the Bhore Ghaut. This is on the line from Bombay to Poonah, which, when completed, will connect Bombay with Madras by way of Hydrabad. The Bhore Ghaut incline is said to be the highest and longest railway incline in the world. The Sömmering incline, in Austria, rises 1325 ft. in thirteen miles and a quarter, while the Bhore Ghaut rises 1831 ft. in about sixteen miles. It is a vast series of viaducts and tunnels. There is one point on the line where, to gain height, the railway sweeps along the face of the mountain; and, as there is no space to turn round, a reversing station was formed, where a new engine is to be attached, so that which was the end of the train becomes the head, and it then ascends a similar incline, like one shelf above the other. The Kummalee viaduct was the most important work on the incline. It was composed of eight arches of fifty feet span, and about 140 ft. high, built of the rock got in blasting the tunnels, which thus formed quarries on the spot of masses of hard solid rock. The work seemed to be of the most solid and enduring kind, and had been inspected by the Government engineers three days before. Our view of the Bhore Ghaut incline is from a sketch by Mr. W. Simpson. The sketch of the broken viaduct is by Captain Holberton, R.A.

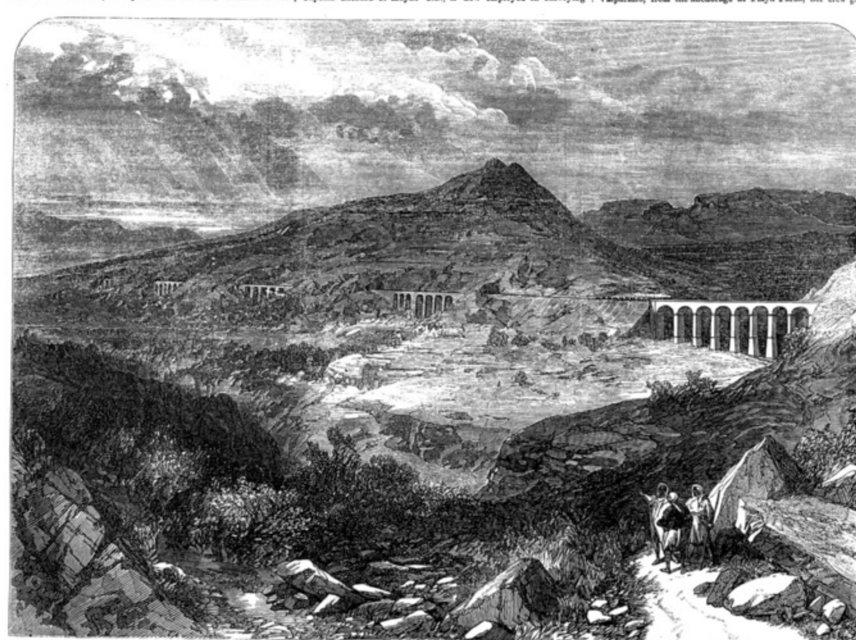
BATALHA, IN PORTUGAL.

The view of Batalha, an Engraving of which is published in this Number, is from a photograph by Mr. C. Thurston Thompson, which is exhibited in the Portuguese section of the Paris Exhibition. It forms part of a series lately executed for the Department of Science and Art, South Kensington. Mr. Thompson's report on photography in the Paris Exhibition, prepared for the Committee of Council on Education, was printed in our last. Batalha is one of the few grand architectural works still remaining in Portugal. The photographic view is taken from the small cloisters attached to the monastery, erected during the reign of Alfonso V. It looks towards the nave of the church, showing the pinnacles and other parts of the edifice, which were much damaged by the great earthquake in 1755. This part of the building has recently been restored, under the direction of Senor Pereira, the able architect appointed by the Portuguese Government some years since to superintend the restoration of this wonderful monument of Portuguese art of the Middle Ages. With a Royal grant of £420 a year, Senor Pereira manages to pay for and quarry all the stone required in the new work, and to keep twenty clever masons (men and boys) actively employed in the work of restoration. The restoration is done in the most perfect way, the new work having all the beautiful finish for which the old is justly celebrated. Labour is cheap at Batalha, the most skilful masons receiving not more than from 1s. to 1s. 6d. per day, and good ordinary workmen from 4d. to 5d.

A SURVEYING PARTY IN TERRA DEL FUEGO.

Her Majesty's surveying-ship Nassau, under the command of Captain Richard C. Mayne C.B., is now employed in surveying the Straits of Magellan and the passage leading northward into the Pacific Ocean, known as Smyth Channel. The frequent use made of these Straits now that steam power is so largely used by our naval and mercantile marine has rendered it necessary that the survey executed in [illegible] by Captains King and Fitzroy, in the Adventurer and Beagle, should be renewed and completed on a larger scale. The Nassau arrived in that desolate region [illegible] in December last, and has since that period been employed about the eastern portion of the work assigned to her. The first occasion of meeting the aborigines of Terra del Fuego was, unfortunately, attended with hostilities. This occurrence, which is the subject of one of our Illustrations, took place on Jan. 3, in Lomas Bay. A party of Fuegians having observed two surveying boats hauled up in a creek on the Orange Bank and the crews tented on shore, approached, after some hesitation, and by signs endeavoured to communicate with the English. They were treated with kindness, and some small presents were given to them, but they soon showed a disposition to steal whatever lay in their way. A watch was kept on their movements; but, notwithstanding this precaution, in the course of the night, one of the officers, while lying down in the tent, was surprised by feeling his blanket sliding away from under him; and, on endeavouring to ascertain the cause, he discovered that a native had thrust his arm under the egde of the tent, and was busily engaged in dragging that article through the aperture. Early on the ensuing morning, as the tide was rising, the party of natives recrossed the creek; but whilst two of them ran into the water and tried to steal some articles out of the boats, the remainder discharged a flight of arrows at the officers in command, one of which severely wounded Mr. Connor, the second master, in the shoulder. On seeing this officer fall, the order was given to fire; and, the first discharge killing and wounding several of the natives, the remainder, after obstinately discharging a number of arrows, retired in considerable haste, apparently much astonished at the result of their attack. The boats soon after this returned to the Nassau, and great care has since been taken to prevent any similar quarrel.

The second Engraving on the same page represents the iron-clad frigate, Zealous, bearing the flag of Rear-Admiral the Hon. G. F. Hastings, C.B. This ship is being piloted through the Straits of Magellan, on her way to the Pacific station, by the Nassau; which service was successfully performed, notwithstanding furious gales, accompanied by heavy rain and mist, which were encountered during her passage through the straits. On March 14, the weather being favourable, the Zealous proceeded alone on her way to Valparaiso, from the anchorage at Playa Parda, her crew giving



THE BHORE GHAUT INCLINE.

in London chaired by Sir William Andrew (1807–1887). The aggressive, freewheeling Andrew and his subordinates frequently tested, and sometimes stepped over, the limits to their authority set forth in the contracts with the GOI.

The lines of the SP&DR were built in discontinuous lengths: north from Karachi to Kotri begun in 1858 (publicly opened throughout in May 1861) followed by sections of the Amritsar–Lahore–Multan route begun in 1859 (the Amritsar–Lahore section opened in April 1862) and the Amritsar–Delhi line begun in 1865. The boats of the Indus Steam Flotilla serviced the 700 miles between Multan and Kotri until, opening length by length from 1870 to 1878, the two towns eventually linked by rail. This juncture also established a through route between Karachi and Calcutta via Punjab, Delhi, and the Gangetic Valley.[19] Initially, SP&DR construction proceeded smoothly with John Brunton (1812–1899) the CE for the Sind section (located in the Bombay Presidency) and his brother William Brunton (1817–1881) the CE in Punjab. Both Bruntons were established engineers and members of a family that by 1881 provided six members elected to Britain's premier professional body for engineers, the Institution of Civil Engineers.[20] The difficulties described below all relate to Punjab, but the Sind section of the SP&DR was not without its problems, including the decision in June 1859 by Joseph and Edward Bray, to abandon their major contract to build the 105 miles from Karachi to Kotri: a decision that resulted in litigation not settled until 1868.

On the Punjab section the agent, Logan White Raeburn, and the chief engineer soon butted heads. Written communication between Brunton and Raeburn preserved in the official records indicated that relationships between the two senior officials of the Punjab Railway became severely strained. Later, a government official wrote that Raeburn's judgment had been "perverted by feelings of personal hostility" toward Brunton. Moreoever, Raeburn, the brother-in-law of the SP&DR chairman, W.P. Andrew appeared to have been prickly, impetuous, and overly willing to depend on contractual authority and, no doubt thanks to the position of his brother-in-law, to refer to the SP&DR Board of Directors in London to carry the day when a less confrontational style toward Brunton and others in Punjab might have been more effective.

Raeburn lost credibility with powerful Punjab government officials who, in turn, had considerable influence on the positions subsequently taken by the GOI. Raeburn suspended Brunton on May 21, 1860. The London Board of the SP&DR, precipitously in the eyes of government, upheld the suspension, and then dismissed Brunton in August 1860.

Agent Raeburn had accused CE Brunton of a variety of misdeeds and misdoings including overstepping his authority, buying items for his bungalow at the company's expense, and colluding with contractors to their mutual, dishonest benefit: charges Brunton labeled "foul assertions and

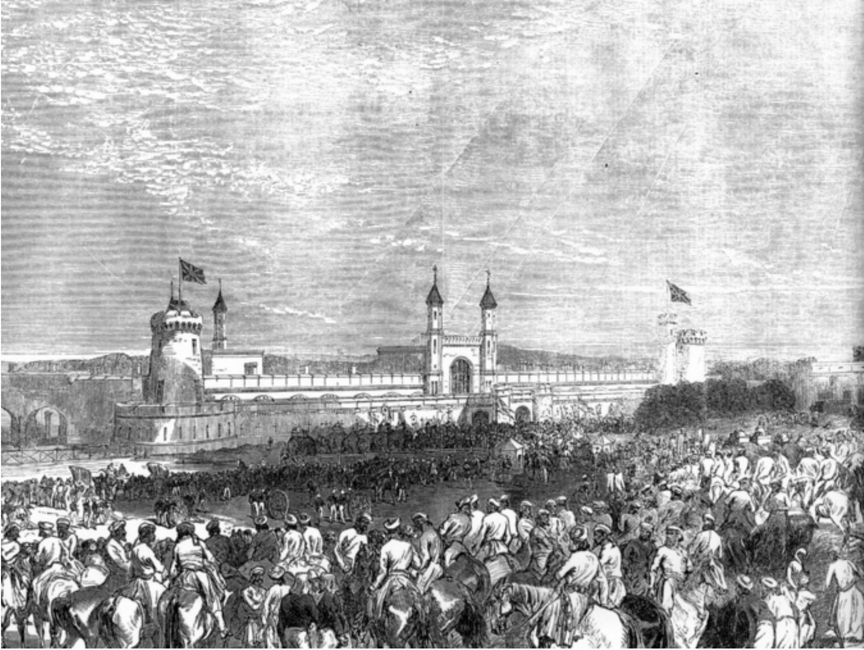
insinuations." The detailed charges and counter charges seem humorous some 150 years later but at the time careers, reputations, and livelihoods were at stake, shareholders' interests potentially jeopardized, and, from the colonial governments' (Government of India and Punjab) point of view, crucial rail building in Punjab in the aftermath of 1857–1858 slowed. In the end, the GOI agreed with the assessments of the lieutenant-governor of Punjab. Brunton was held to be "entirely clear of all charge of dishonesty." Brunton's reinstatement and the recall of Raeburn were urged. The latter, however, could only be removed by the SP&DR Board: the contract did not permit government to do so unilaterally; one of the limitations on its supervisory powers. Brunton never got his job back and the SP&DR Board reluctantly recalled Raeburn in August 1860. Brunton also returned to England, sought restitution for his lost salary and diminished reputation, and then moved to New Zealand where he held the lease to a sheep-run of 30,000 acres and also practiced engineering.

The new agent and the new chief engineer got along and, for a short period, the SP&DR had stable, effective management. However, the agent R.W. Stevens had a paralytic attack in September of 1864. In failing health, he received a 12-month medical leave to go to England but died en route in late January 1865. Major (soon to be lieutenant-colonel) Nicholas William Elphinstone (1825–1907), was appointed agent in August 1865, assumed the agency that autumn. Elphinstone was a mid-level official in Punjab colonial administration at the time of his SP&DR appointment. He was a brother-in-law of Sir Frederick Arthur, deputy chairman of the SP&DR and of Sir Bartle Frere, governor of Bombay Presidency. In short, he was well connected.[21]

Early praise of Elphinstone soon turned to stinging criticism in the *Indian Public Opinion and Punjab Times*, a Lahore newspaper. The newspaper represented the Punjab Railway as "the Augean stable" whose "scandals" had been so long the talk of Lahore that government must have known of them such that if the "Government has been deaf to these reports, it has been the deafness of those who will not hear . . ." By mid June 1867 the government of Punjab was writing officially to the GOI questioning the judgment of Agent Elphinstone which the GOI, in turn, characterized to the secretary of state for India in London as the "irregular proceedings of the Agent of the Punjab Railway." In late June 1867 the GOI established a committee of enquiry into charges of mismanagement and financial irregularity within the Punjab Railway.[22]

The commission had to consider nine categories of charges and nineteen specific allegations of wrongdoing brought against the embattled agent. The proposed indictments revealed a good deal about the complexities and shady opportunities presented by India's early railroads. The first category dealt with SP&DR—government relations within the context of Elphinstone not cooperating properly with the supervisory role the guaranteed contracts assigned to government. Categories six and seven suggested peculation on

Figure 2.2
Lahore Railroad Station, 1864. *Source: Illustrated London News*, December 24, 1864.



the part of the agent. Others made Elphinstone appear incompetent or inclined to cronyism.

The three-person "Commission of Public Enquiry on the Management of the Punjab and Delhi Railway" held their first session at Lahore on July 22, 1867. The final session took place on September 30, 1867. The commissioners held 37 days of hearings. One member of the commission subsequently recalled: "Nothing could have been more trying than those months at Lahore proved to be. Heat was excessive; cholera was raging in the city. The Commission sat from day to day in a miserable ill-ventilated room in the Lahore railway station, the thermometer verging on 100. I can never forget the discomfort and annoyance endured."[23] The result was a document requiring over 650 printed pages to convey their report (180 pages), the daily proceedings, and the appended evidence. Figure 2.2 provides a 19th-century image of the Lahore station within which the sweltering commissioners met. The defensible Lahore station provides a striking example of the British concern for the security of their colonial railroad.

One could linger long over the details of the Elphinstone affair. The specific charges make fascinating reading and do reveal a demi-monde of

fast and loose dealings involving Britons and Indians seeking quick profits from the opportunities railroads presented. Indeed, the account of how Elphinstone patronized his cook, a Monsieur Duranton, by giving him a contract to supply tallow (used as grease) to the SP&DR and later by trying to get him the franchise to run a station refreshment room, is comical.

Throughout their report, the commissioners severely criticized the embattled agent's actions but did not decide the evidence proved Elphinstone dishonest although some of his dealings wore "a suspicious appearance." In sum, the commission of enquiry found Agent Elphinstone guilty of many mistakes and a good deal of mismanagement. He was not held guilty of malfeasance: misguided cronyism, yes; malfeasance, no. Regardless, it was a damning report and government clearly stated the view that Elphinstone could not be reengaged as an agent. Suspended by the SP&DR Board in August 1867 Elphinstone subsequently was let go but on terms that the GOI complained were too generous. General Saunders Alexius Abbott, was appointed agent in March 1868, assumed the agency in August 1868.

Bits and pieces of additional information trickled out during the ensuing months. The additional information cast Elphinstone in a darker light and led government officials inexorably to the view that malfeasance had occurred. By October of 1868, the Government of Punjab advocated the civil and criminal prosecution of the former agent. Nothing happened but criminal cases were brought against smaller fry whose wrongdoings had been exposed because of the investigations.

Two men were tried and convicted of criminal offences. William B. Scott, the Railway Company's acting storekeeper, was sentenced in December of 1867 to 18 months of rigorous imprisonment for misappropriation of the company funds, criminal breach of trust, and criminal breach of trust as a servant (employee). Scott had sold company wood and pocketed the proceeds to a total amount of some Rs. 2,300, of which Rs. 1,915 came from a sale to an Indian contractor, Mela Ram. Scott later confessed to having provided a contractor with a false certificate for 5,000 wooden sleepers in return for Rs. 5,000. John J. Robinson, the chief accountant of the SP&DR, was convicted in the same month of forgery and forgery with the intent to cheat. He received the severe sentence of 7 years rigorous imprisonment and was subsequently pursued in civil court by the Railway Company seeking restitution in the absence of a full and true accounting for sums approaching Rs. 500,000.

One would expect that after two scandals, public enquiry, civil and criminal trials, and increasingly close government scrutiny the management of the SP&DR would improve under the new agent, General Abbott. It was not to be. By June of 1869 (while investigations into the Elphinstone era were still continuing) the GOI complained of the "unsatisfactory condition of the Punjab and Delhi Railways, as evidenced by recent inspection reports, coupled with the frequent and repeated allegations of bad management,

irregular working, and unsatisfactory conduct of several officers of the Company . . ."

Thus, in 1872 a commission was appointed to investigate alleged gross mismanagement on the part of General Abbott, the agent from 1868–1872. This time no fraud was alleged, only incompetence—a charge that may have stung because Abbott telegraphed his resignation to the SP&DR Board on February 16, 1872, to take effect 6 months later. Indeed, General Abbott, who had spent part of his career in Punjab until his retirement to England in 1863, had declared himself technically unfit for the agency when first approached to succeed Elphinstone. Nonetheless, Abbott had been persuaded by his friends in England to take on a position "for which he had no qualification save that of strict personal integrity."[24] Abbott became a member of the SP&DR Board after he returned to England.

The "lucid and judicious" report of the 1872 Commission was quickly produced.[25] The GOI summarized the findings by stating Abbott was "upright and honourable" but that the report dwelt "on the effects of his want both of technical knowledge and experience, and of vigour, in dealing with fraud and irregularities; also on his failure to discover he had to contend against incapacity, as well as dishonesty among his subordinates." Signed off March 7, 1872, its wider recommendations got sidelined by the assassination of the viceroy, Lord Mayo, in the Andaman Island, February 8, 1872. Mayo had shown particular interest in India's railroads and, known to be displeased with the lax management of the SP&DR, might have used the commission's report as justification for a state takeover of the SP&DR. Nonetheless, the problems of the SP&DR probably hastened the state takeover of that company and the formation in 1886 of the state-owned and state-operated North Western State Railway incorporating both the SP&DR, an already existing State Railway, the Punjab Northern (first section opened 1875), and frontier lines such as the Kandahar State Railway.

What can one conclude from this brief look at the mistakes, mismanagement, and malfeasance that occurred on the SP&DR in the 1860s and 1870s? First, the SP&DR might have been the worst managed of the early private guaranteed companies, but it was certainly not the only one with a history of discord, shady, and/or inept contractors and financial irregularities. The GIPR had experienced shoddy contractors. It also had Hurrichand Morojee, the chief clerk or cashier to all the GIPR chief engineers 1854–1866, who embezzled Rs. 57,000 of the company's money between February 1864 and August 1866.

In eastern India disagreements in 1860 between the CE, W. Purdon, and a new agent, P.P. Gordon, on the East Bengal Railway degenerated into a bitter, personal dispute over relative powers and the chain of command. The disagreements between Purdon and Gordon mirrored some of those conflicts present in the Brunton–Raeburn controversy: a tension between trained civil engineers, an emerging technical elite that saw itself as an important and

self-regulating profession expected to demonstrate knowledge-based competencies, and the body of men who found their way into prominent positions like agent via social connections, promotional activities, and financial wheeling and dealing.[26]

The mismanagement and malfeasance of the 1860s did lead to tighter control by the GOI, especially concerning the keeping and auditing of railway accounts.[27] In the aftermath of the "mistakes, errors, irregularities and very often something worse" the GOI Railway Letter of August 5, 1869, to the secretary of state for India stated: "Experience proves that it is hopeless to look to the London Boards, or their Agents, for the exercise of the needful vigilance to prevent these abuses; and the only way in which the interests of the public can be effectually protected, is by the Government preventing irregular disbursements, which can be accomplished only by establishing an effective control on the part of the Government over the accounts and audit of the guaranteed Companies and the establishments which conduct them." Present in much of the material discussed above is the dispute between government in India seeking more control over the private guaranteed railway companies and the efforts of the companies to reduce that control by legal stratagems (e.g., arguments based on the interpretation of the contracts) or extra-legal methods (ignoring government procedures or worse). In the end, government prevailed but it took sometime for that to happen.

"Private enterprise at public risk" had been shown to be more risky than expected. The complicated system of government supervision in India and London over what were, for two decades, private guaranteed companies with London-based boards, largely British capital, and with many promotional interests provided maneuvering space for those who chose to focus on private gain: gain pursued to the detriment of the well-being of the companies they served and that of the people of India who were, in the final analysis, the guarantors of the return railroad investors received. After abuses were uncovered, government slowly began to exercise more effective control. The GOI slowly but inexorably went down the road toward a fully state-owned and state-operated system of railroads as, one by one, the private guaranteed companies were bought out and eventually managed as part of the State Railway system. Thus, the mistakes and malfeasance in the early period contributed to the increased role that government came to play in the ownership and management of India's railroads.

Railroads virtually everywhere in the world presented tempting targets to those who sought illicit gain. India was no different. The age of pioneering derring-do detailed in this chapter was also an age of speculators, peculators, and incompetents. However, serious as the irregularities were in the Indian case, they were minor when compared to what happened in other jurisdictions. Indian history has no figure like George Hudson, whose massive financial chicanery in the British rail mania of the mid-1840s led the *Illustrated London News* to label him the central figure in "an unwholesome

ferment of popular cupidity, pervading all ranks and conditions of men."[28] The wheeling and dealing culminating in the Credit Mobilier and the Erie Scandals of third-quarter 19th-century American railroad history completely dwarfed the activities of an Elphinstone or Hurrichand Morojee. One can argue that the powers government received as part of the *quid pro quo* for the guarantee helped to safeguard India against the massive scandals that occurred elsewhere. The supervisory powers of government may not have been effective as they could have been in the early going but they were present and became stronger.

The heroic, pioneering age of railway building and operation passed and with it the most blatant of the miscreants. The colorful characters, good and bad alike, of the pioneering days gave way to the more uniformly gray but more steady, competent techno-bureaucrats of the later years. It is to those later decades we now turn: decades also full of accomplishment, interest, and the accumulating, increasingly consequential effects of railroads on many aspects of the making of modern India. By the early 1870s the railroads had begun to change India but, as large-scale technical systems, their increasingly ramified presence amplified the processes of change in the decades ahead.

CHAPTER 3

Construction, 1850–2003

Indians built the railroads; they did most of the work and most of the dying. Nonetheless, these were colonial projects directed, initially, by railroad companies headquartered in London following a template established by the colonial authorities. The construction of a line was conceived, managed, and then directed on-site by the British. The layers of interests and interested parties were many: investors, politicians, and members of boards of directors of the private companies in Britain, administrators in India and Britain, supervising engineers, contractors and their agents, and the engineers on the line of works. The connections reached down into the industries and workpeople of Britain who supplied much of the finished or semifinished materials—and the engineers and skilled workmen—to India. In India the construction process ended at many individual worksites where Indians physically built the railroads under the direction of British engineers and British overseers with a leavening of skilled British workmen.

The British presence in railroad construction was crucial but small—roughly 500 people in 1861. They had better conditions of life and work than the much more numerous Indian workers but the British, too, experienced high death and morbidity rates caused by the many deadly diseases that ravaged the worksites. Cholera, for example, killed 25 percent of the Europeans at work on the Bhore Ghat Incline in April and May of 1860. Others, crippled by disease, returned to Britain where they led diminished and shortened lives. For the main part, those who went to India for railroad work were younger men seeking career opportunities not available at home. The lucky ones, or perhaps those with robust constitutions and/or more healthy lifestyles, survived and went on to distinguished careers in India, Britain, or elsewhere in the British Empire.

The British directed the entire construction process—overall and specifically. They also taught Indians those skills particular to railroad construction that were not part of the repertoire of construction practices in pre-railroad South Asia. One chief engineer (CE) reported in 1854 that Indians were learning to lay rails "under the tuition of Europeans" and that with careful direction and adequate pay they would prove able "to perform many of those duties for which they are generally considered unfit."[1] Another CE 6 years later said Indian artisans and skilled laborers worked in their own ways but they were willing to change and to adopt better work practices. Technology transfer was as much a part of railroad construction as it was of railroad operation.[2]

Building a Railroad: Basic Tasks

Once the general route surveys and the detailed line surveys had been completed, railroad construction involved three basic tasks: formation of the line; ballasting and laying the permanent way (the tracks); building/erecting workshops, stations, accommodations for workers, signals and signaling boxes and towers, water towers, installation of the electric telegraph, and many other devices.

Line formation required the most labor. This arduous, time-consuming task was the preserve of Indians. Their muscle power assisted by the simplest of tools formed the line. The formation level, on which the rails were to rest on their sleepers cradled in ballast, was the surface of the roadbed, be it located on the top of an embankment, at the bottom of a cutting, the floor of a tunnel, along the flooring of a bridge, or wherever. The formation level had to be finished to a gradient appropriate to the tractive power of 19th-century locomotives (power which increased with time) and preferably close to a ruling gradient that offered operating economies. Curves, in most cases, had to be kept above a certain radius in order to enable rolling stock to navigate them at a reasonable speed without jumping the rails.

Cut or embanked earth and rock, often in massive quantities that reshaped landscapes, founded the formation level, except in the rare instances where conditions permitted ballasting and plate laying directly on the ground that required little preparation. British supervisors had to make sure earthwork met the engineers' specifications. Earthworking required large numbers of Indians employed as unskilled gang laborers. Other than creating a more coordinated use of gang labor and enforcing standards with respect to the quantity and quality of the work, the British adjusted to long-standing Indian earthworking practices. Men dug the earth and rock; women and children moved it. These people often came to worksites as families. As one observer of earthworking near Bangalore in 1860 reported:

> There were crowds of boys, girls and women engaged in transporting earth in baskets of truly solar topee dimensions. So many people were crowded on one point that in traversing the space between the places of excavation and the place of deposit, they impeded one another considerably. Their to and fro pace was something equal to but not in excess of a sheep driving one, which we have heard described as being neither walking nor standing still.[3]

Tilt wagons and other labor-saving devices were little used in Indian railroad construction. Manual methods requiring large numbers of laborers remained a distinguishing feature of earthworking in India well into the 20th century.[4] In Britain, the increased use of the steam-driven, mechanical excavator in the 1880s marked the end of the era of the navvies: the earthmoving men who circulated from project to project. Interestingly, in the United States, where less labor was available for railroad construction, navvy became the term used for a steam shovel.[5]

Earthworkers in their cumulative millions had to be mobilized, among whom were certain hereditary earthworking groups the British described as the navvies of India. Where the demand for labor was especially great—as at the major inclines or great bridges—mobilization required considerable effort and spatially far-flung recruitment. Advances often had to be provided to induce gangs of workers to go to a worksite. Moreover, although earthworkers were the largest group at most worksites they were by no means the only type required. Blacksmiths, carpenters, masons, brickmakers, riveters, mechanics, divers, and many other skilled workmen were needed. Where the specific skills needed by the engineers were not available in India, they had to be taught. Within a couple of decades the requisite skills were being transmitted from Indian to Indian and skilled workers would move, for example, from one great bridge project to another as work at one site ended and commenced elsewhere.

The opportunities for wage labor multiplied and labor markets expanded. Regional and then interregional labor markets for construction workers emerged. In 1863 Sir Bartle Frere, Governor of Bombay Presidency (1862–1867), asked his audience at the opening of the Bhore Ghat Incline to consider the many positive consequences of what he claimed was unknown before India's railway period, namely "giving a fair day's wages for a fair day's labour" in the new context where Indians had the power to take their labor to the best market. There is good evidence to suggest railroad construction wages were often unfair but the mobility of labor did increase.

Bridges, tunnels, and major inclines—the latter generally involved extensive bridging and tunneling—represented special cases of line formation. They provided the railroad engineers with their three greatest challenges. The natural world had to be more extensively reshaped, surmounted, or penetrated in order to install a rail line. One imported technology, steam

locomotion, established the limits within which another imported technology formed the line: mechanical engineering limited civil engineering.

If much of the earthwork was an amplified version of that which had been done in India for centuries, then the railroad bridges and the tunnels were new: longer tunnels were unknown on the subcontinent before the railway age; bridges, especially iron bridges, of the dimensions and weight-bearing capacities needed for the trains, were likewise novel. Constructing these, therefore, meant the physical transfer to India of exogenous technologies; these technologies in turn required the participation of Indian workers in work processes involving new tools, new machines, and new building materials. New or adapted skills were needed; workers had to coordinate their labor in new ways; the rhythm and pace of work itself was changed and/or intensified. Railroad construction put labor into motion and transferred new tools, new machines, and new skills to India.

Railroad construction got underway in many parts of India in the 1850s and 1860s. Construction and reconstruction has continued ever since including the recent completion (1998) of the impressive 760-km Konkan line down India's west coast. The earliest lines were rarely built telescopically with the completed sections providing transport to the railhead; instead, different parts were commenced independently of one another. Hence a patchwork of railroad construction appeared at many points across the subcontinent.

Building the Bhore Ghat Incline

In 1853 Dalhousie required additional information about possible routes for the Great Indian Peninsular Railway (GIPR) through the Western Ghats. This sent the CE of the GIPR, James John Berkley, and his assistants back into the field to conduct difficult and detailed surveys of a number of possible lines. The evidence they accumulated convinced the GOI in July 1855 that the best routes through the Ghats were, indeed, at the Thal and Bhore Ghats as Berkley had initially proposed. Over 3,000 maps, drawings, and cross sections were required to lay out the precise route to be followed through the Bhore Ghat. Initially, Berkley had proposed a stationary engine to get the trains up the steepest section but the increasingly detailed survey work revealed a new solution: the ingenious reversing section near the summit, shown in Figure 3.1, that kept the maximum gradient to 1 in 37, and thus within the tractive power of mid-19th-century steam locomotives.

Berkley did not live to see the Bhore Ghat Incline completed. A trusted associate of Robert Stephenson prior to his GIPR appointment in December 1849—J.J.B. reached Bombay in February 1850—Berkley's exceptional accomplishments as the GIPR's chief engineer should have ranked him among the great railroad engineers of the mid-19th century—an eminence he surely would have achieved had he lived longer and consolidated his reputation.

Figure 3.1
Bhore Ghat, Reversing Section, 1895. *Source:* Prints and Photographs Division, Library of Congress, "American Memory": "Around the World in the 1890s. Photographs from the World's Transportation Commission, 1894–1896," William Henry Jackson, photographer, http://hd1.loc.gov/loc.pnp/wtc.4a02611.



However, severely ill and worn out from his trying labors in a difficult environment he was forced to return to England in April 1861, and to an early death in August 1862. As his friends observed, Berkley's energy of mind exceeded his physical endowments.

The construction of the Bhore Ghat Incline was a magnificent accomplishment requiring almost 8 years of arduous work. Few obstacles were its equal anywhere in mid-19th-century railroad construction. The great Semmering Incline in Austria, opened in 1854, provided the closest European parallel of the period. The vast labor demands of the Bhore (and nearby Thal) Incline set labor in motion across an extensive part of western India. Some twenty-five tunnels, eight substantial, arched masonry viaducts, the cutting of 54 million cubic feet of hard rock, and the embanking of 67.5 million cubic feet of material were among its requirements. Its cost was equally substantial: some £1,100,000 (over £70,000 per mile) and perhaps 25,000 lives, although the human cost, unlike the financing, was not closely recorded.

Some 10,000 people were employed in 1856, rising to over 20,000 in early 1857. In 1860–1861 the employment averaged 25,000 and peaked at 42,000 in January 1861. The period 1861–1862 again saw an average of 25,000 achieved, rising to 33,000 in January 1862. The bulk of the work was completed by March 1862, so the employment in the year 1862–1863 was considerably less.

Work in the precipitous and isolated conditions of the Ghats was dangerous. On some cliff faces, no footholds existed so workers had to be suspended by ropes in order to drill and blast the right-of-way into the rock. Sometimes, a contractor's agent reported, a worker lost his hold and was "dashed in pieces in the nullahs [ravines] below" which "had the effect of deterring his fellows, altogether, from working for days."[6] The hard rock demanded the extensive use of blasting powder, whose careless use resulted in a considerable loss of life.[7] Falling rocks, slips, and cave-ins were a continual threat.

The laborers existed in rudimentary, unhealthy conditions. Despite the heavy precipitation—150–200 inches during the rainy season—many parts of the Ghat were waterless during the main working season. At first, 1,500 bullocks and their herders were used to transport water from a river 5 miles distant; subsequently a tunnel was dammed before the rainy season to form a reservoir full of water for the dry season. Strong winds buffeted the workers and their flimsy, lean-to dwellings. Sanitation was almost nonexistent. Disease took a dreadful toll. The rains halted work each year for some 4 months except in the tunnels, where it went on year round.

No matter the frequency of accidental death and injury it was a small number when compared to the mortality and morbidity rates caused by cholera and other diseases. Cholera ravaged the workforce almost from the inception of the project but the intensity of the epidemics mounted in the later years as the number of laborers crowded upon the works increased. The 1860 outbreak that killed 25 percent of the Europeans took Indians in numbers "so numerous as to be beyond accurate calculation."[8] The isolated locations of the worksites and the workers' practice of living in "flimsy wigwams" in little colonies near their work meant that the authorities were slow to hear of and to respond to outbreaks of disease. Workers fled when major outbreaks occurred thus slowing or stopping construction until they could be persuaded to return to the incline. "Jungle fever" (likely malaria) took its toll as well—when it did not kill people, it disabled them. A contractor's agent reported in 1858 that during the eight-month working season the Europeans were, on an average, disabled by sickness for some 6 weeks per year. Much sacrifice and a stoic yet heroic determination was required from all who worked on the Ghat. Even those who survived often had their lives cut short, such as James John Berkley.

Insofar as the 19th and early 20th centuries were concerned, the health conditions of the Ghat construction workers were a somewhat more intense

version of what occurred often in railroad construction in South Asia. In the early 20th-century epidemiologists wrote about "large aggregations of tropical labour" congregated at places such as railroad construction sites where crowded, unsanitary conditions almost guaranteed the rapid spread of diseases among the "large numbers of people, poverty-stricken and with lowered physiological resistance, working hard.... "[9] Thus, one way in which railroad construction in South Asia slowly improved, that is became faster and more efficient, came from the engineers in charge paying increasing attention to the health of their workers.

The conditions on the Ghat bred violence and lawlessness. People on the underclass margins of Indian society—tribals and members of low or untouchable castes—were overseen by a rough lot of Europeans within an environment harsh to all. The construction of the Ghat inclines provided experience upon which the British authorities subsequently governed behavior at the sites of public works and regulated relationships between employers and employees. Violence, oppression, and lawlessness did not disappear from subsequent worksites but they were reduced, partly because of the lessons learned and implemented on the Ghats. Moreover, the particular combination of massed labor and deplorable conditions present on the Ghats was rarely so intensely present in future construction. The workers on the Bhore Ghat were intractable for good reasons. Their lives were particularly nasty and often very short.

Railroads in India were constructed either by (a) a large-scale, prime contractor, often from Britain, who won the contract in a tendered competition to construct a substantial section of line under the supervision of railroad company engineers, or by (b) the engineers of the railroad companies themselves who undertook the work departmentally, i.e., they supervised and directed the construction although they frequently let out much of the work, especially earthwork, via a series of petty contracts (often just a verbal agreement with a ganger to move or lay some cubic feet of earth or rock). Sometimes prime contractors failed and the work was completed departmentally.

Contractors included Thomas Brassey, the most successful of the great Victorian railroad builders. Brassey, who never went to India himself, and various partners took three major contracts in South Asia. The first, the Eastern Bengal Railway, may have been unprofitable; the second, a profitable turnkey contract that included provision of ironwork and rolling stock, to build the eastern section of the Punjab, Sind, and Delhi Railroad from Delhi to Lahore, roughly 300 miles, was based on greater experience, more secure estimates, and more generous payments. The third was the Chord Line of the East Indian Railway (EIR).

Some British contractors were men of little experience and little capital. Failures were common and forced the railroads to finish projects departmentally. For example, Norris and Weller, who had taken a contract to construct

part of the northeastern line of the GIPR beyond Bhusawal after a previous duo had failed, also failed conspicuously. The trade magazine *The Bombay Builder* referred to Norris and Weller as "two very upright but two very old and incapable colonels who got to play for a while at contracting."[10]

Berkley was a firm believer in the large contract system and hence the GIPR was built via a series of substantial contracts. The Madras Railway to the southeast, with which the GIPR eventually hooked up, was, in marked contrast, built primarily through the departmental system. Its first CE, 1853–1856, believed as firmly in departmental construction as Berkley did in the use of large contractors.[11]

GIPR contract number 8 to build the Bhore Incline was won by William Frederick Faviell. At first, the work proceeded smoothly. By the end of January 1857, 455,000 cubic yards of earthwork had been excavated, work was taking place on all parts of the incline, bridges and viaducts were underway, and the long tunnel near Khandalla was being tackled on a twenty-four-hour basis by three shifts of workers. Berkley reported favorably on the progress. Despite difficulties in obtaining and retaining labor, Berkley expected the upper part of the incline (Khandalla to Lanowlee) to be completed about the same time as the connecting contract underway above the Ghat.

In June 1857, Faviell claimed he could not afford to proceed under the existing payment schedules and asked for enhanced rates. To reduce his costs and risk, Faviell converted his agents (paid employees) into risk-accepting subcontractors who thus had additional motivation to cut costs and to squeeze labor. Throughout his activities in India Faviell sought to ensure his own profit. His partner on an earlier GIPR contract called him a "conceited and obstinate man" with a "very disagreeable and offensive manner" who treated people under him "as if they were dogs or inferior beings."[12] Faviell's contract was terminated in March 1859 on terms favorable to Faviell to forestall litigation and the delays to the construction that might entail. After he gave up his Bhore contract Faviell constructed railroads in Ceylon (Sri Lanka). These contracts were successful and a well-off Faviell eventually retired to England where he had a long, comfortable life until his death in 1902.

Meanwhile, relations between Berkely and Faviell, between Faviell and his agents, and between the massed Indian workmen and their European employers continued to deteriorate. The Indian workforce on the Ghat turned violently against their European masters on January 20, 1859, after the subcontractors, some of whom were months in arrears with their wage payments, had began on January 17 to pay out wages at half the promised rate.

Europeans were attacked with sticks and stones. Later, armed Europeans went to the coolie huts to arrest the ringleaders. A shower of stones drove the Europeans away. One European who had wandered away from the armed party was later found shot dead, but by whom and why was never discovered.

The riot was the culmination of a festering situation on the Ghat. After a visit to the Ghat works in August 1858 a junior British official reported to

his superior that the workers were subjected to "constant instances of trivial ill-treatment which go quietly to form the settled popular feeling that the English are an oppressive race and the Government indifferent."[13] Later, after the outbreak in January 1859, one senior British official observed that it was a wonder given the conditions on the Ghat and the undoubtedly shameful treatment of the laborers that an outbreak had not occurred sooner. Moreover, he said, "It is evident that the labourers have been most grossly abused in the matter of their wages."[14] Subsequently, official enquiries were launched, the police presence increased, and legislation rapidly passed (Act IX of 1860, The Employers' and Workmen's Disputes Act) to provide the government with additional powers to deal with strained labor relations at the sites of public works.[15] The lessons the British learned from the Bhore Ghat extended well beyond civil engineering and they were applied well beyond the Ghat construction.

With Faviell gone construction continued under GIPR departmental supervision until a new prime contractor was obtained in England. He was Solomon Tredwell (1822–1859), an established contractor from a family of British railroad contractors. Tredwell's tender was accepted in late summer 1859; he arrived in Bombay October 29, 1859, to begin on-site supervision; he died November 30, 1859, from dysentery after a visit to the line of works. Alice Tredwell, his widow, assisted by William Tredwell, brother of the deceased and a silent partner in the contract, kept the contract and saw it through to completion thanks to the efforts of Adamson and Clowser, two GIPR engineers released to become the Tredwells' supervisory agents in western India. In later years, and with less success and more acrimony, Adamson and Clowser took large contracts of their own to build sections of the GIPR's southeast line beyond Poona.

Other events added to the drama of the Ghat Incline's construction and early years of operation. Line maintenance was difficult. The heavy rainfall, in particular, took its toll on the trackbed, the embankments and cuttings, and the masonry viaducts. Landslips were common.

A spectacular event occurred in 1867 (see Figure 2.1). The Mhow-ke-Mullee Viaduct had been completed early in the construction of the Bhore Incline, soon after which rumbling noises were reported in the ravine below. The viaduct was examined often and slight cracks identified but, since they did not appear to be spreading, they were assumed to be harmless and the rumbling noises ignored. The viaduct consisting of eight, 50-feet arches carrying the line 135 feet above ground level collapsed at 6:50 AM on July 17, 1867, only a few days after a thorough inspection by the CE of the GIPR and a senior government engineer. A plate layer engaged in tightening keys (the device that secures the rail to its tie) on the viaduct shortly after the transit of a passenger train felt the ground start to give way and, running as fast as he could, made it safely to the end of the bridge. An ascending goods train neared the viaduct at 7:40 AM and only the sharp eyes of the Indian fireman prevented disaster. He saw the collapsed bridge in the nick of time.

The fireman subsequently crossed the ravine on foot to warn a descending goods train. Two, possibly three, catastrophes had been narrowly avoided. No one was dead or injured but the viaduct was destroyed and rail traffic disrupted. Much handwringing and investigation followed. Faulty masonry work and possible scamping (deliberate use of inferior or inadequate materials and practices to shave costs) was identified as a cause. The viaduct was rebuilt only to be torn down decades later and replaced by a continuous embankment.

Improvements and alterations to the Bhore and Thal Ghats inclines have often been undertaken. The inclines carry a heavy load of passengers and goods trains since they link the huge city of Mumbai and its great port to much of the rest of India. An observation made in the 1890s is as relevant in the early 21st century as it was then. Few travelers, the author wrote, passing up and down the two Ghat inclines "quietly seated in comfortable railway carriages" realized the "extraordinary nature of the obstacles" overcome by "the great skill and daring of all those engaged—especially during the first years—in shaping and carving out of the rocky mountain sides" the lines along which those passengers easily and securely traveled.[16]

Later improvements to the inclines included the elimination of the famous reversing section of the Bhore Incline. This major advance, completed in 1928, required the construction of three new tunnels. Electric traction came to both inclines in 1928 when, coupled to the completion of electrification from Bombay to Kalyan in 1929, enabled electric working from Bombay to Igatpuri via the Thal Ghat and Bombay to Poona via the Bhore Ghat.

Track widening along the inclines to accommodate modern, wider rolling stock was undertaken between 1945 and 1951. Built initially to 12-feet centers (the distance between the center of one track and its parallel mate on a double line; put another way 12-feet centers provided 6 feet of clearance between the up and down tracks, insufficient to enable modern, wider rolling stock to pass one another) the lines had to be rebuilt to the new standard of 15 feet 6 inch centers. To do this, cuttings, banks and, most difficult, tunnels had to be widened. All of this required the use of sophisticated methods and equipment unknown to the original builders of the inclines. Some tunnels were opened up—"daylighted"—and became cuttings while other tunnels were widened through the use of a specially designed steel staging inside the tunnel that enabled slowly worked traffic to continue while the work of widening, including blasting, continued on the other side of the staging.

Tunnels

Most tunnels were built after 1870 when construction advanced into the slopes of the mountains of west and north India, and through the hilly areas of central India. The Thal and Bhore Ghats were the location of most of the

early tunnels—twenty-five on the Bhore aggregating 4000 yards with the longest being 435 yards—although the 900-foot tunnel on the East Indian Railway near Monghyr took 5 years (1856–1861) to complete after quartz rock so strong as to limit advance to 4 feet per month was encountered. Nonetheless, tunnels always remained a special and dangerous problem for the railroad builders. Initially, tunneling skills were unknown in South Asia so Welsh and Cornish miners had to be recruited in Britain.

The longest tunnel in India prior to the 1990s was the 4,322-feet Parsik Tunnel constructed between 1913 and 1916. Interestingly, it is on the main line from Mumbai to the Ghats but is located in the Ghat approaches miles below the inclines, and southwest of the important junction of Kalyan. Tunneling reached new levels of achievement when Indian Railways (IR) built its high-speed Konkan line in the last decade of the 20th century. Ninety-two tunnels extending along 52.5 miles were built. The longest of these, the 4-mile Karbude tunnel near Ratnagiri, is now the longest in South Asia.

Bridges

Building secure bridges was the third of the great challenges that faced India's railroad engineers. Bridges—be they masonry viaducts, massive iron spans, or combinations thereof—were required in considerable number. Those built in the hills and mountains to cross ravines or relatively narrow rivers could be substantial structures. However, the greatest bridges crossed the big rivers of the Indo-Gangetic Plain, including crossings of the mighty Indus and Ganges rivers, and the lower reaches of the rivers of western and southern India where those rivers widened considerably near the sea. It took some decades of bitter experience before the engineers understood how deeply below the riverbed they had to place bridge foundations in order to secure them from the scouring effects of the extremely high flow levels carried by many rivers after the rains and, for the Himalayan headwatered rivers, additional water from snow and glacier melt. The engineers also learned that training the rivers by bunds and rock deposits to stay in established channels near the bridges reduced bank erosion and limited the effects of scour. Pier design to minimize resistance to water flow also improved over time.

Put in a nutshell, inadequately founded and poorly designed bridges collapsed or were severely weakened. Their ill-designed piers lost their footing and tilted or fell down because the massive, high-velocity water flows scoured out the sand and rock within which and upon which they were emplaced. The bridge spans, of course, collapsed along with their piers. Shoddy workmanship or corner cutting sometimes contributed to the

failure although lack of engineering understanding was usually the more important cause.

The bridge of the Bombay, Baroda and Central India Railway across the Narbadda River in western India suffered flood damage in its first building season, 1857–1858, and again in 1859–1860.[17] It opened for traffic in July 1861, suffered from flood damage in 1864, 1865, and 1867, and lost three piers in a heavy flood in August 1868. Bridges of the Sind, Punjab and Delhi Railway across the Jumna, Sutlej, and Beas rivers, completed in 1869, were badly damaged in the first major flood they faced in 1871. The Beas failure caused a terrible accident when a passenger train dropped into the swollen river.

The great rivers of India mandated the large-scale use of iron, and later steel. Long spans were needed to reduce the number of costly, difficult to build, water-impeding piers. Brick or stone arches could only span short distances and required many more vulnerable piers so their use was limited. There were, of course, some lovely and impressive masonry bridges—often styled viaducts—or bridges where much of the work was in stone or brick with iron and steel girders used only to span short sections between multiple piers. An example of the former was the Dapoorie Viaduct, built in 1854 and still in use today, that links Bombay Island to the mainland near Thana. A splendid example of the latter was the Ehagaon Viaduct—completed ca. 1861 and significantly improved in 1899, 1949, and 1951—on the Thal Ghat Incline (whose other viaducts were entirely masonry). Seven hundred and fifty feet long and one hundred and eighty-two feet high the Ehagaon Viaduct crossed a deep valley approached by tunnels at each end. Three 40-feet masonry arches carried the line at each end of the viaduct, with the remainder of the distance spanned by iron girders resting on masonry piers. Figure 3.2 provides a fine picture of the restructured Ehagaon Viaduct taken in 2005; it shows a train crossing the bridge in the aftermath of the rainy season when the Ghat landscape is verdant. On the Kalka–Simla mountain line (built 1899–1903) "multi-arched galleries looking for all the world like ancient Roman aqueducts" were the most used structure to bridge ravines.[18]

Nonetheless, for bridging the great rivers iron/steel became the preferred material. Bridge superstructures were fabricated in Britain, shipped to India, and then transported laboriously (especially in the days before extensive lines of railroad were in operation) to inland worksites. There, the engineers supervised the assembly of the ironwork on the piers leading their colleagues in Britain to label them, deprecatingly and unfairly, as "Meccano Engineers" after the sets of minature girders, spars, struts, and nuts and bolts with which British children put together toy bridges and other structures.

The massive amount of iron and steel work required by Indian railroads—one has to add the huge demand for rails into the mix—represented a major market for British manufacturers and a steady source of profitable employment for British shipowners. By the end of 1863 nearly 3 million tons of

Figure 3.2
Ehagaon Viaduct on the Thal Ghat Incline, from a 2005 Photograph Showing a Goods Train with Two Electric Locomotives at the Rear of the Wagons. *Source:* IRFCA (Indian Railways Fan Club), on-line Photo Gallery, http://www.irfca.org/gallery/GeneralScenes/landscapes/Img_0889.jpg.html.



railroad material valued at over 15 million pounds had been sent to India in 3,571 ships. Through the 1860s each mile of railroad required, on average, one ship from Britain transporting 600 tons of material. Each ship, of course, required insurance (more than one foundered enroute) thus providing benefits to the financial sector of the economy of Queen Victoria's Britain. Railroads in India provided many positive entries in Britain's balance sheet of empire.

Construction of a great bridge required 3–5 years. Small towns housing many thousands of workers and their families grew up close to the bridge sites. Houses had to be built for the engineers and foremen, and huts for the laborers before bridge construction began. Workshops for carpenters, ironworkers, and mechanics, brick and lime kilns, and brickfields had to be made ready. Plant (machines and tools) and material had to be collected and stored. The Alexandra bridge (built 1870–1876) needed 15 miles of tramways "which were in constant use by night and day during each working season."[19] Each site required many unskilled laborers plus

masons, bricklayers, brickmakers, mechanics to keep the machines in operating condition, carpenters, blacksmiths, rigging and scaffolding experts, erectors and riveters, and with the entire Indian workforce supervised by some 40–50 European engineers, foremen, guards, and skilled fitters.

A young and still relatively unknown Rudyard Kipling, then working as a journalist for an Anglo-Indian newspaper, visited the construction site of the Kaisar-i-Hind bridge across the Sutlej in February of 1887. He described a seemingly chaotic sight.[20] "Lines of every gauge—two-foot, metre and broad—rioted over the face of the pure, white sand, between huge dredger-buckets, stored baulks of timber, *chupper*-built villages, piled heaps of warm red concrete-blocks, portable engines and circular saws." Toiling men swarmed everywhere. Riveting had started. A few hundred men, paid by the piece, worked like devils "and the very look of their toil, even in the bright sunshine is devilish. Pale flames from the fires for the red hot rivets, spurt out from all parts of the black iron-work where men hang and cluster like bees. . . ." The noise was startling from one hundred yards away but deafening within the girders where the noise bounded and rebounded. Earlier, in 1886, the piers had been sunk in a hurry to reach a secure depth before the flood waters arrived. "Men worked in those days by thousands, in the blinding sun glare, and in the choking hot night under the light of flare lamps, building the masonry, dredging and sinking, and sinking and dredging-out."

Kipling's real-life observations, transposed to an imaginary bridge across the Ganges, became part of his well-known short story, *The Bridge Builders*. The imagined bridge was, with its approaches, "one mile and three quarters in length; a lattice-girder bridge, trussed with the Findlayson truss, standing on seven-and-twenty brick piers" whose construction required "a humming village of five thousand workmen." The bridge and its builders were threatened by flood waters—as many real bridges were—enabling Kipling to create a dialogue among the gods of Hinduism overheard by a stupefied, nearly drowned bridge builder. Lord Ganesh, the elephant-headed God, talks about towns drawn together by the fire-carriages; another speaks of pilgrims brought more swiftly and in greater numbers to holy places; Lord Krishna declares "the beginning of the end is born already. The fire-carriages shout the names of new Gods that are *not* the old under new names." Kipling has the Gods of Hinduism speak about the engines of change.

The fundamental and slowest job in bridge building was to found the piers and abutments. This involved the sinking of brickwork wells or iron cylinders deep into the sandy beds of the rivers. Wells 80–100 feet below low water levels became common. The Dufferin bridge (opened in 1887 and after 1947 renamed the Malaviya bridge) across the Ganges at Benares had two of its piers sunk to 141 and 140 feet respectively.[21]

In theory, sinking a well was simple and based on methods used in South Asia for centuries. Normally, the work was undertaken in the dry season

although even then a cofferdam could be needed to keep out water. Iron cylinders or brickwork were placed on top of a cutting edge and sunk into the riverbed—under their own weight or with added weights if necessary—until just above lower water level. Additional cylinders or brickwork were attached and the process repeated until the well reached the desired depth and a firm footing. Concrete that set in water sealed the bottom and then the whole well was filled with normal concrete, sand, or rock. The abutments and piers were founded on the tops of the wells and then the great iron spans fixed on the piers.

In practice, it was slow, difficult, and dangerous work to which many innovations were applied both in the pioneering decades and subsequently. Shallow wells for small bridges across small watercourses were dug by traditional well-sinkers and divers. One man went into the well with a small basket, loosened the material at the bottom with his feet, dove under water to fill the basket and then handed the basket to his companion above. The two men, changing places occasionally, were able to sink a well some 12–14 feet below water level. Deeper wells required the use of the hand-worked Indian *jham* (dredge) or adaptations thereof, while the additional depths came to be excavated by larger, bullock-worked, British-designed dredges. They, in turn, came to be supplemented or replaced by steam-powered dredges (see Figure 3.3) or sand pumps. In some cases, for example the Koomar and Ishamuttee bridges on the Eastern Bengal line, the bottom of the well was excavated by hand, by workmen inside a pressurized caisson: air, workmen and baskets of earth gaining ingress and egress to the caisson via an elaborate system of valves and trapdoors.[22]

Sometimes the wells encountered strata that could only be pierced by hand digging; sometimes expensive dredging devices broke free and settled in the murky, water-filled bottoms of the wells. In these cases another British innovation was used. Air-supplied divers were sent down to dig or to retrieve the tools. This was dangerous work because the perils of deep-water diving under pressurized conditions were not well understood.[23] Some divers were crippled for life by the bends. At first European divers were used but Indians soon were persuaded to take to the diving apparatus. Thirty-two Indian divers supervised by one European foreman were employed on a bridge built in the early 1890s.

Over time, engineers in India learned how to build secure bridge foundations and to span greater distances. Lessons were learned from the initial mistakes and failures. Improved techniques, tools, and materials acquired through the interplay of experience and advances in scientific and technical knowledge were preserved and transmitted via educational institutions, professional journals, manuals, and lectures. Bridge building was only a particularly impressive and highly visible manifestation of the advances that occurred across the many dimensions of railroad construction.

Figure 3.3
Bridge Construction, Late Nineteenth Century, Showing Steam-powered Dredges Used to Sink Foundation Wells. *Source:* Photo album, "Kistna Bridge, Bezwada," Institution of Civil Engineers, Archives, London, England. Reproduced with permission of the Institution of Civil Engineers.



Technology Transfer and Indian Workmen

By a different route but with a similar effect Indian workmen learned new skills, which they preserved and transmitted among themselves and to their children. Indeed, the technologies of railroad building were transferred to India by British engineers and other transfer agents, supplemented by and adapted to existing practices in India. The evolving bodies of artifacts, practices, and knowledge came to form what one historian describes as "a new, syncretic 'Indian approach' to railroad building."[24] The greatest adaptations came in the intensive earthworking activities related to line formation, but even in plate-laying, tunneling, and bridge building the technology transfer from Britain was always adapted to the sociotechnical realities of India. Indeed, one adaptation made by the more successful British engineers was to work with Indians and Indian practices rather than to force the unwilling to accept a British way of accomplishing something. The engineers who built

(1896–1904) the Assam–Bengal Railway's difficult hill section utilized Indian tools and appliances whenever possible "and where they did not affect the progress of construction, native customs of labour or even prejudices were not interfered with."[25]

A story recounted by a railway engineer in India in the 1870s evocatively captures Indian insistence on the use of Indian ways of working:

> It has been often attempted to introduce the wheelbarrow mode of work, but with little success. The basket of antiquity—probably antediluvian—still holds its own. I have heard of an instance of an enthusiast in wheelbarrows who, having exhausted his morning energy in the fond endeavor to restrain a gang of coolies from using the objectionable basket, had the mortification, on making his evening tour of inspection, to find them carrying the wheelbarrows on their heads, in the belief that it was only a convenient modification of the principle.[26]

The headbasket, often carried by women and children, long continued to be a much-used device for moving earth from a cutting or to an embankment: one still sees it used often today at construction sites in India. Men dug and women carried: in the 1850s and 1860s when, for example, the 6,269,061 cubic yards of earth, moved during the construction of the Bhore Ghat Incline, were carried by coolies averaging 15–20 miles a day, of which half was with loads; in the 1890s when MacGeorge noted the continued, widespread use of manual methods of earthworking; in the 1960s when humans and their animals still did much of the earthworking.[27]

Nonetheless, the construction processes continually improved. Work forces became more easily mobilized, more effectively managed and better supported: sanitation, housing, and disease control got better—it was still a tough, hard life for the Indian workers but it was better. On the technological side, advances were incrementally continuous although always melded with the continued and extensive use of human and animal labor. At one bridge site in the early 1890s (the Bezwada bridge with twelve spans of 300 feet carrying the East Coast State Railway over the Kistna River, built 1890–1893) the foundation wells were sunk by bullock-powered dredges. Each dredge required four bullocks, one bullock man, and two men in the well. Sixteen dredges—and thus sixty-four bullocks and about fifty men—were needed and they were "as fast, efficient, and cheap as the other more civilized methods now to be referred to."[28] The latter, two 40 cubic feet steam-worked Bell's dredgers, were "only so much better than the primitive bullock system as to justify its retention as a reserve to overawe the bullock-drivers, who were a troublesome and bad-tempered lot, always ready to strike."

Electricity increasingly powered construction tools (e.g., hand-riveting gave way to machine riveting and the increased use of welding) and larger

machines and, via electric lighting, permitted shifts of workers to labor day and night at major construction sites like bridges. By the time the Hardinge Bridge was constructed (1909–1915) at Sara over the formidable lower Ganges River (deep, wide, prone to great rise and fall, and with unstable banks) the magnitude and concentration of the work led to the decision to employ electric power throughout the process. Thus, two powerhouses, one on each bank, had to be built where substantial boilers and Beliss-Westinghouse generators produced a "440 volt, 50 periods, three-phase" current transformed up to 3,300 volts for the bridge circuits and "transformed down to 440 volts for supply to the machines."[29] Costing Rs. 35,132,164 this bridge with its massive river training works, fifteen girder spans, each 345 feet, three land spans of 75 feet each, and sixteen foundation wells all sunk 150 feet or more below low-water level (the deepest was 185 feet) demanded the utmost from the supervising engineers and workpeople alike.

Training-works designed to prevent the river from shifting course near the bridge site and to protect against scour required 28,300,000 cubic feet of pitching stone whose individual boulders weighed between 65 and 165 pounds. These had to be brought to the worksite by rail and water from quarries 134–234 miles away. River-training in India had reached new standards of excellence by the early 20th century and began to influence hydraulic engineering elsewhere in the world. The masterful civil engineer, Francis Spring, published a major treatise on river training and control in 1903.[30] This work, an excellent example of the accumulation, transmission, and codification of knowledge that was central to the routinization of the technical side of railroad building in India, was read by many engineers outside India, among whom were members of that formidable body of hydraulic experts, the U.S. Army Corps of Engineers.

Cement and the ironwork for the Hardinge Bridge came from Britain. Workpeople were assembled from many parts of India. They were kept more healthy by a water treatment plant designed to supply 10,000 gallons of filtered water, and by sanitation measures coupled to the extension of cholera control into neighboring villages. Quinine, good drainage systems, jungle-clearing, and "the oiling of stagnant water with crude petroleum during the mosquito-breeding-season" kept malaria in check.[31] The great bridge at Sara, like its predecessors and successors, required sophisticated, far-reaching logistical arrangements and the effective support of the thousands of assembled workpeople.

Frontier Lines

The assembly, maintenance, and protection of workers presented a special problem where the construction of railroads on India's frontiers was

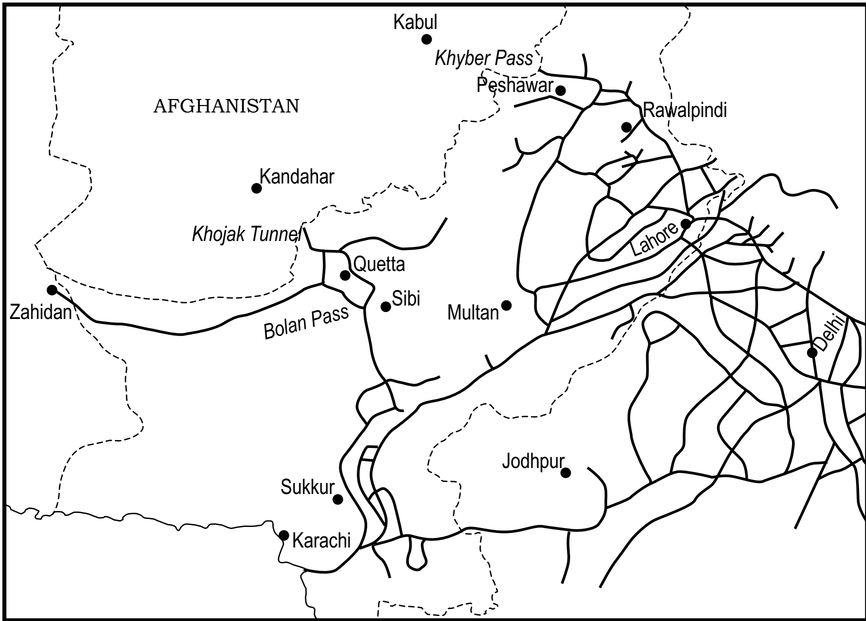
concerned. The frontier to the British meant primarily the areas in India's northwest although there is also a fascinating story to be told about construction and operation in the swampy, jungle-filled, and often hilly northeast.[32] If the northwest was usually too dry, the northeast usually was too wet. Below we focus on the northwest—a choice dictated by considerations of available space and by the fact that the turbulent northwest gripped the British imagination, as it continues to do worldwide in the 21st century.

The areas of the northwest now form the little populated, earthquake-prone borderlands adjoining Pakistan and Afghanistan. Images of the dry, rugged mountains and intervening valleys—hot in summer and bitterly cold in winter—occupied by a variety of poor, proud, well-armed tribal peoples suspicious of one another and of outsiders have become a staple presence in global television in the aftermath of 9/11, the Taliban, and the on-going war(s) in Afghanistan. It was, however, an area into which the British drove railroad lines from the late 1870s onward. Workers had to be imported from considerable distances only to face danger from disease and from attacks by tribesmen. In June 1885, 2,000 of an assembled workforce of 10,000 died in an outbreak of cholera in the upper reaches of the Sind-Peshin Line after malaria, cholera, scurvy, and other diseases previously ravaged those constructing the line. The executive engineer wrote in a report dated March 19, 1886, that Europeans and Natives alike "suffered from diseases in their worst and most malignant forms: typhoid fever, ague, cholera, chills, inflammation of the lungs and pernicious coughs" were the "chief scourges."[33]

Security and defense of their Indian Empire motivated the British. The borderlands were turbulent. The British wanted to be able to move security forces quickly into the area. Afghanistan was a worry (three Anglo-Afghan Wars occurred in less than a century), particularly because the British feared the potential influence Czarist Russia might gain over Afghan rulers, and the threat (more imagined than real) the expansion of Imperial Russia into Central Asia might then pose to the security of India.[34] Thus, construction of rail transportation into this vast, inhospitable, and forbidding region became a priority. First and foremost, these were military railroads and, as such, built primarily to the 5 feet 6 inch gauge to ensure the movement of troops was not slowed by break of gauge (see Chapter 4).

Map 5 displays the results of many decades of railroad building on the northwest frontier. The main thrust into the borderlands began with the Kandahar State Railway built north from near Sukkur on the Indus to Sibi. The 134 miles were built in 101 days (war was raging in Afghanistan) with the last stretch of track laid on January 14, 1880. The terrain was a flat, dry, largely uninhabited desert where much of the track could be laid directly on the ground. The great challenges were logistical including ensuring food and water for the roughly 3,500 workers at the railhead. Once Sibi, only 433 feet above sea level at the foot of the mountain ranges and one of the hottest places in South Asia (its mean summer temperature is 96°F), was

Map 5
Railroads in the Northwest.



reached construction pretty much came to a halt. The mountains and ravines between Sibi and Quetta had to wait for the iron horse.

Construction resumed in 1883 as a hush-hush, inconsistently pursued project with the innocuous name of "The Harnai Road Improvement Scheme" since the British had promised to stop railroad building in that area. Subsequently, the rail line again became a matter of highest priority to be pushed forward with little regard for the lives of the engineers and construction workers. By March 1887 a through line to Quetta, named the Sind–Peshin State Railway, was opened via Harnai and Bostan. Among its many remarkable feats of engineering the Harnai route went across Mudgorge at 5,873 feet above sea level—a deep glen filled with dry mud 1,700 feet deep that becomes a thick soup when wet—and through spectacular gorges as shown in Figure 3.4. Those and other obstacles were overcome with great difficulty and kept operational through enormous effort and frequent reconstruction. Eventually, a huge flood in July 1942 so extensively destroyed the works in the Chappar Rift that the working of the upper reaches of that line ended.

Quetta, location of the largest troop cantonment in that part of India, continued to be reached via the line through the Bolan Pass. A makeshift line with meter gauge sections through the Bolan to Quetta opened in August

Figure 3.4
Gorge and Railroad Line Showing Tunnel and Bridge, Northwestern Railway near Quetta, 1895. *Source:* Prints and Photographs Division, Library of Congress, "American Memory": "Around the World in the 1890s. Photographs from the World's Transportation Commission, 1894–1896," William Henry Jackson, photographer, http://memory.loc.gov/service/pnp/cph/3f00000/3f06000/3f06300/3f06392v.jpg.



1886. Broad gauge throughout was installed in 1888–1889 although Abt rack and pinion locomotives had to be obtained from Germany to work the steep sections. Washouts and complete destruction of bridges, however, made it an unreliable line. The heavily engineered, 59-mile Mushkaf-Bolan section was authorized to bring permanent, all-weather rail transportation to Quetta. Requiring many tunnels and bridges it was completed in 1895. A stretch in the Bolan Pass winds through a narrow defile through the Dozan Gorge during which the ravine is crossed nine times in 4 miles. One author calls it a "sinister place" of "rugged grandeur" with the line "burrowing through the rocky crags which tower high above their stony bed", via "a succession of mighty girder bridges and tunnels."[35]

The original plan for the Kandahar line expected the city of Kandahar in southeastern Afghanistan—in recent years a Taliban stronghold—to be the terminus, but the British decided to stop at the border at Chaman where a depot was established with enough rails, sleepers, bridge material, and so on to complete the 67 miles to Kandahar if an emergency arose. The section from Bostan to Chaman through the Khwaja Amran mountains became known as the Chaman Extension. Built to a steep ruling gradient of 1 in 40 it rises to 6,394 feet at Shelabagh and "drops" to 4,304 feet at Chaman. Six tunnels were needed in its 68-mile length including the mighty Khojak Tunnel which, at 12,870 feet, was the longest tunnel in India at the date of its completion in September 1891 (work began April 1888). Defensible, crenelated towers rise from both entrances where the tunnel pierces through a steep, dry, barren mountain. Treacherous water-bearing strata required the employment of 65 experienced Welsh miners who had worked on the Severn Tunnel in England. An army of workpeople was assembled from across South Asia—and beyond since the workforce included Tibetans, Arabs, and men from Zanzibar. Living conditions were hard. Water was in short supply. Winter was characterized by bitterly cold winds. Typhus killed 800 men in the winter months of 1890–1891. Pneumonia killed many others throughout the construction.

Further north, the Khyber Pass provided the most-used passage through the mountains along the ancient trade route linking northwest India and Central Asia via Kabul. Because of its strategic importance a rail line through the Khyber Pass was long considered by the British but was held by some to be impossible terrain for a railroad. However, spurred by the Third Anglo-Afghan War, Colonel G.R. Hearn directed a brilliant survey in 1919 that established a viable route. Built to a costly, high standard between 1920 and 1926 the 26-mile Khyber Pass Railroad began at Jamrud (at the entrance to the Pass already connected to Peshawar by a 10-mile line opened in 1901; Peshawar had been reached by rail in 1883). The line required four reversing stations to handle particularly difficult alignments, thirty-four tunnels, and ninety-two bridges and culverts.

Delicate negotiations with the local tribes were part of the process of building the Khyber line. However, workpeople were assembled easily. The integration of the market for construction labor that began with railroad building in the 1850s had found full effect by the early 1920s. One engineer working on the Khyber line wrote that his workers were collected from an "immense reservoir" of workers in every branch of construction: "it does not take very long in India, for railway construction is an old-established industry there, and the whisper soon runs through the bazaar that the Sirkar is about to start a great work at this or that place."[36] Many also applied to be part of the subordinate staff of low-level supervisors among whom were some whose families had worked on railways for three generations.

Building the Khyber line was an adventure in every way. The terrain was difficult and sometimes treacherous; the weather could be unpredictable and turn nasty very quickly. Little donkeys in their thousands, "tiny little beasts, not much larger than calves", often provided transport to the worksites or moved panniers filled with a few shovelfuls of earth to construct embankments. And then there were the local tribesmen, Pathans and Sherwanis, often at one another's throat, all armed, and for whom taking a potshot at an engineer seemed good sport. There was opposition of one tribe, the Sultan Khel, to the construction of the line, but their participation in the construction was obtained when an executive engineer suggested to them the loaded trains climbing steep gradients would move slowly and could be easily looted. "Build the railways and loot the trains" became the basis upon which the Sultan Khel's cooperation was achieved.[37]

Map 5 displays all the frontier lines including the 440-mile Nushki Extension Railway leaving the Quetta line at Spezand. Built mainly for military purposes during the First World War through inhospitable, uninhabited desert for most of its length, it reached Zahidan in Iran in 1918. An official report referred to it as work in waterless, "dreary and dismal-looking surroundings" " in a derelict section of the Empire, far removed from the blaze of modern civilization with its various amenities." "Irritation, mental and physical, set up by the blistering and blinding violence of a fierce North wind roaring and sweeping over the country five days out of seven at a maximum velocity of 60 miles per hour" added to the discomfort of those who built the line.[38] Little used in peacetime the stretch beyond Nok Kundi was taken up in 1932 only to be relaid and opened again in 1942 when Germany threatened the Middle East during World War II.[39]

Late 20th-Century Construction: The Konkan Line

The steady improvements in the materials, machines, and methods of railroad construction throughout the period 1850–2005 could be recounted in vast and interesting detail. From the more effective use of ballast and better designed and more durable ties (sleepers)—concrete increasingly replaced termite-attracting wooden ties—to heavier weight rails welded into ever-longer continuous lengths and to longer, stronger steel girders—and more recently pre-stressed concrete girders—for bridge superstructures, the changes have been many. Workpeople became more easily assembled and better managed; tools and machines became more sophisticated and, of course, no longer dependent on human and animal power.

The 471-mile Konkan line built in the 1990s illustrates well the many advances in the processes of railroad construction that had been achieved by the end of the 20th century. This line extends from Roha in the Konkan

southwest of Mumbai to Mangalore midway down the west coast of the South Indian Peninsula. It cuts through the narrow, coastal lowland located between the rugged Western Ghats and the Indian Ocean. It is difficult terrain: often sharply incised and threaded with short, swift rivers originating in the nearby Ghats; tidal estuaries requiring much bridging exist where conditions force the line to hug the coastline; seasonally high rainfall and treacherous soil conditions add to the difficulties. Thus, this "missing link" down India's west coast (Mangalore had been reached in 1908 by a 137-mile line extended northwards from Calicut) had long been contemplated (the first serious proposal dates from the 1890s) but never implemented because of the financial and engineering obstacles. Many investigations and proposals occurred after 1945 and became more detailed and insistent in the 1970s. However, nothing definitive emerged until the late 1980s. Financing such a project was a major problem. Suitable financial arrangements necessarily precede major construction.

The massive capital requirements for the Konkan line were beyond the ordinary budget allocations allotted to IR for new line construction. In the 1990s IR had approximately Rs. 250–300 crore (1 crore = 10 million) per year for all of its new line projects and the proposed Konkan line alone required that much on an annual basis for 4–5 years. In fact, by 1997 the Konkan project was costing Rs. 700 crore per year. The financial and administrative solution was to establish the Konkan Railway Corporation in 1990 as a public limited company whose equity capital was shared by the Central Government (Ministry of Railways, 51 percent), the State Governments of Maharashtra (22 percent), Goa (6 percent), Karnataka (15 percent), and Kerala (6 percent). Additional money was raised from tax-free bonds sold on the open market in India and abroad. Loans had to be resorted to at critical early moments in the project, otherwise work would have been halted. The Corporation is a public sector undertaking with its own Chairman and Managing Director under the administrative control of the Railway Ministry.[40]

Financial issues had continued to dog the Konkan line but it was completed and the final section to open to traffic (13.6 miles, Sawantwadi–Pernem opened January 26, 1998) completed the direct rail link from Roha (and hence Mumbai) to Mangalore. Mumbai to Mangalore became a rail trip of 614 miles compared to the previous, circuitous distance of 1,265 miles. The approximately 180 major bridges, 1,600 minor bridges, and 52 miles of tunnels spread over ninety-two locations along the largely single-track line (albeit with provisions for future doubling) built to a ruling gradient of 1 in 150 and a maximum curvature of 1.4 degrees provide the potential to work much of the line up to a speed of 100 miles an hour.

Throughout the construction process the latest in modern machines, tools, and scientific and technical knowledge were utilized. The surveyors used one-second theodolites and distomats that measured distances and

Figure 3.5
Konkan Line, Panvel Nadi Viaduct, early Twenty-First Century. *Source:* Web site of Larsen and Toubro Limited, http://www.lntecc.com/BUImageGallery/bridges/pages/bridges_Img3.htm. Photo credit, L&T Photo Unit.



differences with great accuracy. Pre-stressed concrete (PSC) girders, resting on seemingly impossibly slender, concrete pillars, were used extensively for bridges and viaducts. The 1,390-feet Panvel Nadi Viaduct shown in Figure 3.5 crosses a deep ravine with its tallest piers (slipformed, hollow, octagonal structures made with M25 and M35 grade concrete) exceeding 197 feet. Built as a PSC box continuous span bridge with PTFE/stainless steel bearings the Panvel Viaduct required nine spans of 131 feet and two spans of 98 feet. Approached by a 3,641-feet tunnel at the north end and a 13,373-feet tunnel at the south end the viaduct builders used a technology—including incremental launching of the box girders—not previously applied in India. Precise workmanship of the highest order was required and achieved.

Three hundred and eighty-nine miles of earthworking for cuttings or embankments totaling over 3,080 million cubic feet of moved earth was required. *A Treatise on the Konkan Line* states most interestingly that whereas as late as the 1960s and 70s earthwork was done almost entirely by manual labor and animals, as it had been since the mid-19th century start of railroad building in India, by the 1990s few people were "willing to do such a

hard job" (p. 148). Therefore, the Konkan line was built through the use of mechanical excavators, tippers, bulldozers, rollers, and water sprinklers.

Tunnels presented the greatest challenge. Despite the use of sophisticated techniques and the most modern machinery—including seven sets of giant drilling jumbos and hydraulic loaders from Sweden to supplement Indian-made machinery—some tunnels through soft soil with a high water table almost defeated the tunnelers, and, in the event, were responsible for the delays in opening the line. "Sometimes," the *Treatise on the Konkan Line* states, "the progress was at a standstill for months leaving the engineers wondering when the tunnel would be through." The 5,002-feet Pernem Tunnel was begun in January 1992 and, thanks to repeated collapses, was the last to be finished in January 1998.

Various methods to overcome soft soil conditions were suggested but eventually the traditional method of mucking-out, heading and benching followed by the setting of the concrete floor, sides and roof of any given section, and then mucking-out, heading and benching and concrete setting over and over again, had to be used. Arched roofs collapsed, cave-ins occurred, nineteen lives were lost including eight buried together in a sand blowout in the Honnavar (4,920 feet) tunnel, yet slow foot-by-foot progress did occur and the tunnels did get built. Some contractors failed and, again in a story repeated many times from the 1850s onward, the railroad engineers completed work departmentally.

New line construction did not end with the full opening of the Konkan line. IR continues to build new lines in the early 21st century. Fifty-eight miles of new line opened in the reporting year 2001–2002. And, in what can almost be the equivalent of new construction, the conversion of meter gauge to broad gauge, continues apace: 161 miles in 1999–2001; 57 miles in 2000–2001; and 131 miles in 2001–2002.

Construction and Its Consequences

Construction, obviously, preceded operating railroads and their engines, carriages, and wagons that transported people and goods hither and yon across the subcontinent. But construction was more than a first act in the history of Indian railroading: it was a dramatic, fascinating, consequential, and continuing story in its own right. And, as any railroad person will tell you, good construction followed by good maintenance of the permanent way is essential to the safe and efficient operation of a railroad.

Construction, in fact, had its own significant effects on South Asia. Millions of Indians—perhaps 10 million in the last half of the 19th century alone—were mobilized to build the railroads. Men, women, and children often traveled great distances to a worksite. The construction labor market extended across the regions of India. In the 1890s railways were built

in Assam by Pathan labor.[41] Makranis (from the Makran Coast, west of Karachi) were also present as were coolies from less distant Chapra (west of Patna) and Tirhut.[42] Other earthworkers came from the Central Provinces and from Bengal. Nepalese did the dry stonework; carpenters, stonemasons, and bricklayers came from the Punjab while Cutch supplied masons and bricklayers; riveters and bridge erectors came from Bombay.[43] In the same decade Punjabis and men from Maharashtra worked on the bridge over the Kistna river at Bezwada.[44]

Railroad construction shaped landscapes and cityscapes. Nature was subdued and the impress of the railroad became a permanent, palpable presence—be it the presence of a great terminus building in the heart of a great city, a great bridge, or simply the ribbons of steel track across rural India. Whether and when an individual town or city came to be located on a railroad line influenced the subsequent development—or underdevelopment—of that urban place. And, since this was a colonial railroad system, the early decisions about railroad routes were little influenced by the needs and concerns of Indians.

Slowly, historians are also beginning to understand that railroad construction (and operation) had significant environmental consequences for South Asia. Embankments impeded water flows and created breeding areas for malaria-carrying mosquitoes. Railroad ties (sleepers) consumed vast amounts of timber (in the early years, wood also was used as fuel in the steam engines) and contributed to deforestation as did the demand for wood to fuel the kilns in which great quantities of bricks were fired for bridges, stations, and other structures. More recently, environmentalists sharply criticized the proposed Konkan line. In the neighborhood of Goa the proposed alignment of the track was held to jeopardize a made environment of considerable antiquity and interest, and a natural environment of considerable importance. These protests delayed construction and did result in some minor adjustments to the alignment. More recently, environmentalists have suggested that the industrial development the Konkan line may bring to the hitherto little developed area between Roha and Mangalore may have deleterious effects on the fragile ecosystems of the Ghat foothills and narrow coastal strip.

The construction of India's railroads was a magnificent achievement in the face of what was often great adversity: disease, harsh terrain, flooded rivers, scorching temperature, and much more confronted the workers and the engineers. Indians did most of the work and most of the dying but many a British engineer found an early grave in India. The central accomplishment is captured in a few statistics. India had 9,723 route miles of track in 1881, 24,185 in 1901, and 41,052 in 1941: then as now the world's fourth largest railroad network. For good or bad, railroad construction has left a substantial mark on the Indian subcontinent. Indians of the 21st century live with the social, economic, and ecological consequences of a century and a half of

railroad building. However, railroads are built to be operated and it is time to return to that side of the story. The next chapter resumes the narrative at a time, roughly 1870, when a momentous and controversial decision was made to build railroads in India to a gauge considerably narrower than the hitherto standard broad gauge of 5 feet 6 inch.

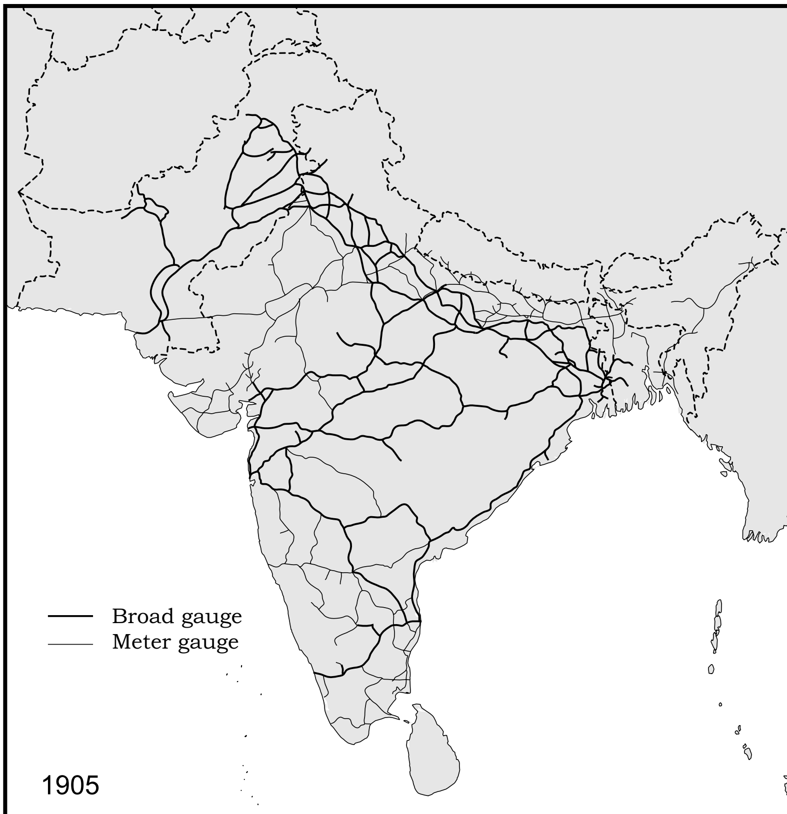
CHAPTER 4

1870–1905, Overview

In 1870 India's railroads exhibited a modest, skeletal, structure of trunk lines extending along 4,771 route miles that connected ports and other centers of colonial administration and commerce (see Map 4). By 1905 the modest presence of 1870 had given way to a complex railroad system encompassing 26,955 route miles administered by a plethora of different organizations including private companies, state railroads, railroads owned by the state but operated by private companies, and railroads owned (and sometimes operated) by some of the princely states. Permanent railroad employees increased from 69,233 in 1870 to 437,535 in 1905. Great railroad workshops, each employing many thousands of skilled workers, dotted the landscape. Passengers and goods traveled across the length and breadth of India in substantial numbers. What had become by the early 20th century the world's fourth largest railroad network increasingly became more used, more ramified, better regulated by new laws, and more subject to effective control from the Government of India (GOI). Map 6 shows how extensive the network of lines was by 1905.

Moreover, the first decade of the 20th century saw the emergence of nationalism as a powerful, assertive force capable of influencing the course of railroad history and much else in the making of modern India. Similarly, railroads—in ways that became increasingly clear—influenced the course of South Asian nationalisms.[1] This story is picked up in Chapter 6 but for now one can note that 1905 saw large-scale public agitation—and some acts of violent protest—in the Bengal Presidency as Hindu Bengalis engaged in sustained opposition to the British plan to partition Bengal into two administrative units with the Moslem-majority parts of Eastern Bengal (now largely within Bangladesh) forming a new, separate province.[2] The protests

Map 6
Railroad Routes in 1905.



activated nationalists and spawned the Swadeshi ("Own Country") movement. A few trains were bombed or otherwise disrupted. Railroad workers took up the cause with enthusiasm and labor grievances became mixed with nationalist sentiment in a series of strikes by railroad workers.

Two significant developments marked the start and the end of the period 1870–1905. Implementation of the decision to build as state-owned and state-operated railroads lines of a narrower gauge—the 3 feet 3 3/8 inch or meter gauge—was underway by 1870. In 1905, the Railway Board was created to provide executive leadership of what had become a railroad system of considerable size and complexity. Bracketed by these two consequential decisions the period also included wider processes and other specific decisions and events that had significant effects on the railroads and the making of modern India.

More generally, 1870–1905 saw India's railroads evolve out of a pioneering phase fraught with poorly understood difficulties and many mistakes—failures of engineering and management—into a period of incremental, evolutionary advance as most aspects of railroad construction and operation within the South Asian context became better understood, better implemented, and more routine. Moreover, the expansion of the rail network grew considerably—indeed grew at a faster pace than during the period 1853–1870. Route mileage of 4,771 in 1870 increased to 26,955 in 1905 meaning 22,184 additional miles had been built and brought into operation: roughly, on average, 652 miles were opened every year compared to 298 in the pioneering era. The rail network grew, and it did so at a faster rate.

One reason for the increased pace of construction was found in an influential recommendation of a parliamentary commission appointed to examine the causes and potential solutions to the famines that had severely afflicted many parts of India in the 1860s and 1870s. The report of the Indian Famine Commission said India required 20,000 miles additional miles of line to assist in famine prevention and relief, of which 5,000 miles were needed immediately.[3] In this case, government's railroad policy—influenced by the Famine Commission but certainly not fully implementing the commission's recommendations regarding new rail lines—responded to the needs of Indians. However, as early nationalist critics of colonial railroad policy pointed out, railroads were a double-edged sword where food grains were concerned. Yes, the railroads could and did move food grains to famine-stricken areas. However, the same railroads more thoroughly commercialized and integrated the markets (leading to an increasingly singular national market with price convergence) for the same grains and vastly facilitated the growth of an export trade in food grains (notably wheat) from India to other parts of the world. Thus, in the closing decades of the 19th-century India became a significant exporter of food grains at the same time as parts of India were stricken by famine. The engines of change rarely moved unequivocally down a track unambiguously designed to benefit India and most Indians.

The length and density of the rail network increased substantially. In the region of greatest railroad development, namely the parts of the Gangetic Valley located within the United Provinces, only the most insignificant locations were over 20 miles from a station by 1900. Other statistics capture the growing complexity and activity of the overall rail system between 1870 and 1905: 19,283,000 passengers carried in 1871, 231,283,000 in 1905; 3,542,000 net tons of goods carried in 1871; 52,506,000 in 1905.[4]

Law

A major accomplishment occurred in 1890 with the passage of the Indian Railways Act (Act IX of 1890). Enacted into law after many years of

discussion, this substantial, 10-chapter, 150-section act, consolidated, amended, and added to previous (and shorter) railway acts was passed by the GOI.[5] The 1890 Act with surprisingly few major amendments remained the statute under which the railroads of India operated until a major updating took place when a new Railway Act was passed in 1989. One measure of the 1890 Act's complexity and litigious history is found in the massive size of the standard legal compendiums devoted solely to it.[6]

Virtually no research has been conducted by historians into the applications and consequences of this major piece of legislation.[7] We can see clearly from the accumulation of a vast body of case law that it was—and is—a much used statute well known to judges, lawyers, railroad officials, and some consumers of railroad services. We also can see that the act reflected and shaped much railroad practice from the rules the railroad companies enacted to govern the behavior of their employees to the rights and liabilities of the railroads as common carriers and, on the other side of the coin, those of passengers and shippers. We can also note that railroad law in India drew heavily upon British law—analogous laws relating to British railroads and also British common law. Adaptation to Indian conditions there was but, on the whole, Act IX of 1890 reflected the presence of colonial rule as did the railroads the act governed. Regardless, Act IX provided the statutory basis for railroad operation throughout India; it was a foundational touchstone from 1890 forward.

A Matter of Inches—The Gauge Controversy

Nonetheless, and regardless of the importance of routine advance and legal consolidation, the development that most affected India and its railroads in the period 1870–1905—and continued to do so throughout the 20th century and beyond—was the implementation of the decision to build meter gauge lines. This involved much more than a matter of inches, of how far apart from one another rails would be. The introduction of a new gauge meant that India's rail network would no longer be a seamless web along which all engines, carriages, and wagons could travel once running rights and rolling stock interchange were worked out between different companies. It meant, in fact, that there would be two rail networks in India, physically divided from one another even when lines of the two gauges closely approached one another. Broad gauge engines and rolling stock could not run on meter gauge lines; meter gauge engines and rolling stock could not run on broad gauge lines. Break of gauge had arrived: an impediment to the movement of people and goods that critics at the time and for many decades thereafter had no hesitation labeling as "the evil" and which even an early advocate of the meter gauge acknowledged to be "the extreme gravity" of the disadvantages break of gauge created.[8] In 1921, one authority summarized received

wisdom as holding that "it is common experience that the co-existence of two standard gauges in any country is ultimately detrimental to public interests, however much opinions may differ as to the magnitude of the evil or its influence on public affairs."[9]

It was hard to find quantitative measures acceptable to partisans on different sides of the controversy. How did one assess the respective costs and benefits of cheaper construction and lower operating costs versus the disadvantages of break of gauge with the incompatible rail networks connected through the cumbersome procedures of physically transferring goods and passengers.

Nonetheless, the issue was debated repeatedly. Four times—1873, 1889, 1906, and 1921—well-attended meetings in London of the premier professional body of British engineers, the Institution of Civil Engineers, discussed the Indian gauge question—one measure of what a contentious issue break of gauge in India continued to be.[10] Participants listened to a serious paper on the gauge problem read by an important engineer or public figure. Extended discussion, at times acrimonious, followed each presentation. One author, for example, found the substantial statistical table he used to support his arguments denounced as "perfectly valueless" and a subsequent critic of the same author claimed his attempt to compare the broad gauge and meter gauge performances "to a great extent fallacious and misleading."[11] Others later submitted lengthy written observations on what had been said. Engineers of stature intervened to support or deplore the decision to break gauge although criticism came to dominate and the concern increasingly shifted to the question of how the problem was to be best fixed.

The answer to that question was given firmly in 1992 when IR adopted a unigauge policy and decided to convert—albeit over an extended number of years—most lines to the broad gauge. But was the earlier decision to have meter gauge lines in India wrong? Perhaps the best answer is the judicious statement of G.S. Khosla, himself a senior railroad official in postcolonial India, who wrote in 1988: "To blame those who laid the foundation of such a system, which has in the course of time, emerged as two separate country-wide systems . . . is to ignore the inexorable facts of history which no human endeavor can ever escape."[12] What we can do is describe the difficulties of transshipment and provide some information about the decision to break gauge and its subsequent history.

Once the meter gauge system reached substantial length—and by 1905 there were 10,619 miles of meter gauge lines—any solution to the break of gauge became difficult. Most solutions, of course, required a good deal of money and could not be easily implemented precisely because of that requirement. This problem was an excellent example of the conundrum mentioned earlier in this book: railroads in their early years were an innovative, change-producing transport technology but, once geographically emplaced in a certain fashion—including gauge choice—they became imbedded (quite

literally), fixed capital and an inertial presence not easily changed; or at least not changed without substantial, new infusions of capital investment not easily made available.

Nonetheless, Indian Railways (IR) has pursued a unigauge strategy and a portion of the Ministry of Railway's annual budget was often provided for line conversion even before unigauge became the settled policy. By 1995 these expenditures had made a difference: the broad gauge extended over 39,612 km, the meter gauge covered 19, 209 km, and various narrow gauges (often special purpose mountain lines that are unlikely to be converted) a further 3,838 km. Put another way, in 1905 when the total rail mileage in India was 26,955 miles the meter gauge represented almost 40 percent of the total; in 1995 when the total was 43,398 miles (62, 659 km) the meter gauge represented 31 percent of the total. Map 6 displays the broad and meter gauge lines in 1905.

A Meter Gauge—Broad Gauge Transshipment Point, Mokameh Ghat

We can capture something of the difficulties of transshipment at a broad/meter gauge interchange thanks to the words of Edward James (Jim) Corbett (1875–1955).[13] A renowned hunter and conservationist, after whom India in 1957 named its famous tiger sanctuary in Garhwal the Corbett National Park, Corbett made his living in his early years as an employee of the Bengal and North Western Railway (BNWR) as a fuel inspector and later a transshipment inspector. The BNWR was a meter gauge line that "connected" with the trunk line of the broad gauge East Indian Railway (EIR) at the Mokameh Ghat (near Patna) on the south bank of the mighty Ganges (Ganga) River after BNWR goods' wagon and passengers were ferried across the river from the BNWR's station and yard at Samaria Ghat on the north bank of the Ganga. The BNWR had no lines of its own south of the Ganga but transshipment occurred in big brother's marshalling yards: meter gauge had to come to broad gauge even if it required a ferry ride. The ferry requirement made this a particularly complicated interchange, but since, in that part of India, all meter gauge development had taken place north of the Ganges, it was not unique.

In 1895, Jim Corbett, not yet twenty-one, found himself in charge of transshipping goods from broad to meter gauge wagons and *vice versa* at the Mokameh Ghat through which 80 percent of the BNWR's long distance traffic passed. During the busy season, March to September, Mokameh became so congested as to cause long delays and financial loss to the BNWR. The man in charge of the ferries told Corbett he was taking on an impossible task and that he should turn down the position. Corbett found the situation to be even worse than the ferry superintendent described—the unloading sheds were crammed full, 400 broad gauge and 400 meter gauge wagons

awaited unloading, and a thousand wagons waited on the north side of the river to be ferried across. The big labor company that held the transshipping contract throughout the EIR broad-gauge operations was largely indifferent to the interests of the BNWR.

Nonetheless, Corbett took the position and succeeded. In 1895, roughly 400,000–500,000 tons of goods were transshipped annually; 21 years later when Corbett gave up the job a million tons a year moved through Mokameh Ghat.

At Mokameh, Corbett initially had a staff consisting of his stationmaster Ram Saran, assistant stationmaster Chatterji, 65 clerks, and 100 men employed as shunters, pointsmen, and watchmen. An additional 100 clerical and menial employees worked under his direction at the BNWR's Samaria location. These workers, however, did not do the actual work of unloading and loading wagons. Those, Corbett had to hire directly as casual workers paid on a piecework basis. He felt it unwise to hire Labour Company men but he did hire their relatives. He selected eleven men whom he appointed headmen instructed to provide ten men each to transship goods and a twelfth headman to provide a gang of sixty men and women to handle coal. The presence of different commodities meant different castes and religions had to be employed so his twelve headmen included eight Hindus, two Moslems, and two men from depressed castes. Only one headman was literate so Corbett appointed additionally one Hindu and one Moslem clerk to keep the accounts. Thus, to start, Corbett mobilized a workforce 172 strong to load and unload the BNWR's wagons. The 172 members of the transshipment gangs illustrate another important point made previously in this book. Those for whom the railroads of India provided employment included many not enumerated as permanent employees in the annual statistics. Casual, contract workers like those at Mokameh Ghat—or those employed to build or repair the permanent way—could be as numerous as the more favored, permanent employees of the operating lines.

> While one Labour Company was doing the work of both railways the interchange of goods had taken place from wagon to wagon. Now each railway was to unload its goods in the sheds, and reload from shed to wagon. For all classes of goods, excluding heavy machinery and coal, I was to be paid at the rate of Re 1-7-0 (equivalent to 1s. 11d. at the rate of exchange then current) for every thousand maunds of goods unloaded from wagons to shed or loaded from shed to wagons. Heavy machinery and coal were one-way traffic and as these two commodities were to be transshipped from wagon to wagon and only one contractor could be employed for the purpose, the work was entrusted to me, and I was to receive Re 1-4-0 (1s. 8d.) for unloading, and the same for loading, one thousand maunds. There are eighty pounds in a maund, and a thousand maunds therefore are

> equal to over thirty-five tons. Those rates will appear incredible, but their accuracy can be verified by a reference to the records of the two railways.

The initial months for Corbett and his people were difficult, dramatic times. He had taken the job at the start of the busiest season. The sheds were already full so Corbett risked unloading a thousand tons of wheat on to unprotected ground outside the sheds so that the emptied wagons could be filled with goods already piled up in the sheds, thus clearing space to unload other wagons. No rain occurred, the grain survived, and booking of goods through Mokameh resumed within 3 weeks of Corbett's arrival.

However, for almost 3 months Corbett was unable to pay his piecework gangs. The BNWR's Audit Office was slow to adjust to the new situation and neither Corbett's salary nor money to pay the gangs arrived. The gangs worked 7 days a week from 4:00 AM to 8:00 PM, the hot season reached furnace-like conditions, gang members pledged their pitifully small possessions—usually the jewelry of the women-folk—to obtain credit to buy food and still no money from BNWR headquarters at Gorakhpur reached Mokameh. Only loyalty to Corbett kept the gangs at work.

Finally, the twelve headmen came to say that they could work no longer without pay but, upon discovering that Corbett, too, was reduced to eating one *chapati* and a spoonful of lentils (*dal*) per day, they said they would continue but they begged Corbett to help them. Corbett had been appealing to Gorakhpur daily for funds. When the headmen left, he telegrammed headquarters to say: "Work at Mokameh Ghat ceases at midday today unless I am assured that twelve thousand rupees has been dispatched by the morning train." A telegraphic reply said the money would arrive the next day: news that quickly reached the workers. The money arrived brought by "a jovial Hindu" pay clerk "who was as broad as he was long and who exuded good humor and sweat in equal proportions." He opened his cash box, guarded by two policemen, and extracted twelve string bags, each containing 1,000 newly minted silver rupees. And then, from a capacious pocket, he produced an envelope containing bank notes totaling Rs. 450—Corbett's arrears of pay for 3 months. The crisis was over and the transshipment of goods at the Mokameh broad/meter gauge interchange continued smoothly even while Corbett was absent, in France serving in the British Army during World War I.

The operation of other transshipment points probably were not as dramatically complicated as Mokameh—and if they were they did not have a splendid writer such as Corbett to transmit their history to future generations. Even so, Corbett's evocative account gives us an almost palpable glimpse into the complications break-of-gauge brought to the Indian railroad system.Figure 4.1 shows us what a transshipment area looked like—not the Mokameh interchange but a comparable one at Nagpur photographed in 1883.

Figure 4.1
Break of Gauge Transhipment Yard, Nagpur, 1880s. *Source:* Photo album, "Nagpur and Chattisgarh State Railway, 1883," Institution of Civil Engineers, Archives, London, England. Reproduced with permission of the Institution of Civil Engineers.



The Decision to Break Gauge

The road to break-of-gauge and places like Mokameh Ghat began in earnest during the administration of Lord Lawrence (Viceroy, January 1864 to January 1869). Serious, urgent discussion about new ways of constructing and operating railroads in India began in the highest levels of the GOI. The finances of the GOI were in bad shape, a situation to which the private, guaranteed railroad companies contributed. They needed annual transfers of money from the GOI because of their high construction costs and the failure of most lines to make a profit sufficient to cover the guaranteed 5 percent return on shareholders' capital. The "gift of the elephant" was a continuing burden on the finances of India.

A few days before he left office, Lawrence summarized the position of the GOI regarding the future of India's railroads in a substantial minute dated January 9, 1869. Much was addressed and the need for an expanded rail network described within a context informed by the straitened finances of the GOI. Lawrence said that attempts by the GOI to get capitalists to build additional railroads in India at their own risk had failed completely. In a

powerful repudiation of the notion of private gain at public risk Lawrence wrote: "It is an abuse of language to describe as an interference with private enterprise what is only a refusal to support private speculators and to guarantee them from all possible loss by the credit of the state, or to allege that the investment of capital by private persons is hindered by the government executing works, when private persons refuse to do so at their own risk."[14] What was needed, Lawrence wrote, was cheaper railroad construction and operation which, he argued, could be achieved through state-owned, state-built, and state-operated railroads.

Lawrence then opened the door to break of gauge. Engineering skill, he wrote, required adaptation to circumstances which, in a poor country like India, meant economical construction as much as technical prowess. India could not support additional costly lines like those built previously; hence to reject out-of-hand a narrower gauge for those much needed lines where the cost of the broad gauge would be prohibitive, would be a "most mistaken view." In short, Lawrence advocated (1) state-owned and run railroads of which (2) some, after careful cost/benefit examination, might be built to a narrower gauge.

The GOI led by Lawrence's successor as viceroy, the ill-fated Lord Mayo (from January1869 until his assassination on February 8, 1872), continued to pursue actively matters of railroad policy including break of gauge with the authorities in London and their political boss, the secretary of state for India. By October 1870 the London authorities accepted the need to build some lines to a narrower gauge and by early January 1871 that gauge was fixed at 3 feet 3 3/8inches. Thus, and despite continuing controversy (which reached into the House of Commons where Prime Minister Gladstone assured the Members of Parliament that all arguments regarding gauges would be considered carefully) over whether a specific new line should be broad or meter gauge (and in two hotly contested instances in the 1870s lines begun as meter gauge—the Indus Valley line and the Punjab Northern line, Lahore to Peshawar—were opened as broad gauge lines thanks to the power of arguments based on colonial military-strategic considerations), the emergence of a meter gauge system had become accepted policy. Also accepted was the emergence of a State Railway system—initially restricted to meter gauge lines but soon expanded to include broad gauge lines. By 1881, the State System (including lines under the jurisdiction of provinces) encompassed 3,058 miles of which 1,692 were meter gauge and 1,366 were broad gauge.

The initial proponents of meter gauge lines made their argument primarily on economic grounds. Thornton began his defense in 1873 of the narrower gauge to the skeptical engineers of the Institution of Civil Engineers with a first sentence that declared: "The one solitary reason for the Indian Government adopting a narrow gauge was belief in its superior economy."[15] The plan was to restrict the meter gauge to well-defined areas where the

broad gauge could not be remunerative and where other factors (e.g., military/strategic) did not intervene. At the cost—the evil—of transshipment the meter gauge lines would serve less-favored areas and they would be subservient to the broad gauge lines. The latter, alone, would have access to the great ports.

Meter Gauge Expansion and Continuing Controversy

And so it was for almost 20 years. In ca. 1890 meter gauge railroads were to be found north and east of the Ganga River starting from longitude 80 degrees east, in Rajasthan and Gujarat, and in the area south and west of the broad gauge line connecting Bombay and Madras. But this clear demarcation began to change. As the meter gauge expanded and became more efficient (improvement in rolling stock etc. increasingly enabled meter gauge lines to carry larger, faster traffic loads), pressures (from competing railroad companies and from users located along the meter gauge lines) grew to connect adjacent meter gauge lines and to gain direct access to most major centers of trade including the ports. By 1905 some meter gauge lines became competitors rather than feeders of the broad gauge lines. The prospect of two competing national rail networks operating on different gauges emerged and regional competition became an actuality where lines of different gauges crossed or paralleled one another. In 1947, newly independent India found itself with 14,931 miles of broad gauge track, 9,788 of meter gauge, 1,423 miles of narrow gauge (2 feet 6 inches and 2 feet) and 53 transshipment points where broad and meter lines connected. Thirty-one were in North India, twenty-two in South India with roughly eight of the fifty-three—among which Mokameh Ghat was one of the most important—handling the bulk of the transshipments.

State-owned and State-run Railroads

The introduction of the meter gauge was only half of the story that began to unfold in the early 1870s. Previously, the railroads of India had been broad gauge lines owned and operated by private companies headquartered in Britain albeit with a GOI-guaranteed profit and a good deal of government supervision.[16] The latter, though, did not prevent mismanagement nor prove hugely effective in keeping costs down. Indeed, in August of 1870 Lord Mayo suggested that as soon as the early contracts provided (and those contracts did have a clause giving the GOI the right to buy out the companies after a certain number of years—usually 25 years) those lines should become state-owned. State-owned and state-run railroads, GOI officials believed, would be cheaper (regardless of gauge), better run and, more responsive to the needs of India. As Lord Mayo wrote in 1869: "direct action of the State" was "most likely to bring about generally satisfactory results. . . ."[17]

Initially operated as a branch of the Public Works Department the State Railway System grew rapidly. After a brief flirtation with an administrative structure that provided some degree of provincial control, the state system became a centrally directed system administratively located within the Railway Branch of the GOI's Public Works Department. Employees of the state system (state-owned and worked excluding princely states) numbered 112,710 by 1905. They could be posted anywhere within the system. Particularly for the managerial and professional staff, moves from one part of the country to another were not uncommon.

Inter-line Cooperation and Coordination

The proliferation of lines and management structures made the need for inter-line cooperation and coordination more pressing. To this end the Railway Conference was formed (discussions as to formation began in 1876). It met first in 1879, and periodically thereafter, to provide the forum within which senior officials from all of India's railroad administrations could meet and formulate policies and procedures to enable all the lines of India to work better together: in short, to function better as a network of lines, as a national network, despite the multiple jurisdictions.[18] Thus, among the early rules framed by the conference were those intended to ensure unrestricted interchange of rolling stock between broad gauge lines. With that in mind, and looking to the future, early conferences decided that when the mechanisms for continuous breaking were introduced in India all lines should adopt the same system to ensure safe interchangeability of rolling stock. On this point, interestingly, the conferees were influenced by the negative example of Britain where failure to standardize braking systems had resulted in inconvenience, insecurity, and expense. This decision demonstrates what sometimes happens in technology transfer, namely a country that adopts a given technology later can benefit from the mistakes of the earlier adopters, and can leap-frog to more advanced or more proven forms of a given technology.

Early conferences also began to frame new general rules and regulations applicable across India that would be needed under the new Railway Act (IV of 1879) then under consideration. A similar process occurred in the run-up to the 1890 Act. The conference became more active and encompassing after its transformation to a permanent body, the Indian Railway Conference Association, in 1902. After 1947 its reason for being—inter-line cooperation—largely disappeared when India's railroads became completely nationalized although it continued to exist on paper. Nonetheless, in the absence of complete nationalization during the colonial period the Railway Conference provided an important vehicle for enhancing the India-wide integration of railroad operations.

In retrospect, we can see that the decision to begin state-owned and state-operated railroads in India probably initiated the long-term process whereby all the railroads in India became state-owned and state-operated. At the very least, the decisions in and around 1870 made such a development more likely, if not inevitable. However, a complete state system did not appear until after 1947, and the decades after 1870 presented an almost Byzantine-like mixture of railroad administrations—even though, as argued above, by 1905 more central, government control of all India's railroads was in place.

In 1879, it appeared that the movement towards more government control was gathering steam. In that year the GOI exercised its twenty-fifth year option under the initial contract to buy-out the largest of the private guaranteed companies, the EIR. The 1,504-mile EIR became a state-owned railroad but it was not brought within the state-operated system. Instead, a new contract was signed on January 1, 1880, that left the management of the EIR in the hands of the existing private company, favorable provisions were made for the EIR shareholders, government got a somewhat increased share of the operating profits of the EIR (it was one of the very few lines that made money in the early years), and obtained the power to require the EIR to provide running rights to the engines and rolling stock of other lines (state and guaranteed), and to build and operate branch lines connected to the EIR as needed. Thus, the EIR came to have a new status as a state-owned but privately run railroad. At roughly the same time, the other founding, private, guaranteed companies (Great Indian Peninsula Railway, Bombay Baroda & Central India Railway, Madras Railway) accepted a renegotiated contract on terms disadvantageous to the interests of India (negotiated largely in Britain, the changes were opposed by the GOI—but too late in the game to alter the outcome). Government gave up its right to purchase the companies at the end of the first 25 years; company debt owed to the government for previous advances on the guaranteed interest was cancelled; and future surplus profits during the life of the contract were to be divided equally between the GOI and the companies.

The Return of the Private Companies

The maneuverings described above notwithstanding, most new railroad construction and operation in India in the decade 1870–1880 had been within the state system. This changed considerably in the early 1880s. The Famine Commission Report had recommended the immediate construction of some 5,000 miles of new lines and other considerations also pointed to the need to expand the rail network. However, the GOI found it difficult financially and ideologically to build new lines: financially because its budgets and debt burdens had reached onerous levels; ideologically because a powerful pressure

group in Britain had consistently opposed the Indian experiment with state-railroads and had lobbied for a return to private, guaranteed construction and operation. The fact that Indian railroad politics took place primarily in Britain among British interested parties lobbying British politicians points yet again to the colonial context of India's railroad development.

The concatenation of pressures resulted in the decision to return to private enterprise at public risk, albeit more circumscribed risk. The modified guaranteed system was introduced: the guarantee became 4 percent reducing to 3.5 and 3 for later start-ups; the guaranteed period became shorter; shareholders were made more responsible for economical construction and working by requiring them to assume some of the loss should a line dissolve into complete financial failure. Three new guaranteed companies emerged under these conditions in the 1880s: the meter gauge Indian Midland, merged with the GIPR in 1900; the meter gauge Southern Mahratta Railway; and the broad gauge Bengal Nagpur Railway. The meter gauge Assam Bengal modified guarantee line was started in 1892.

In addition, three unguaranteed companies began in the 1880s. One of these, the largest and most successful, was Jim Corbett's employer, the BNWR. It extended over 1,269 miles when finally taken over by the state in 1943 and it was the only major line to receive no direct government money throughout its existence. The other two, the Bengal Central and the Rohilkhand and Kumaon, ran into difficulties, got government support, and eventually were wound up and merged into other units. Throughout the 1880s and 1890s, short, local lines—often in the form of "light" railways (i.e., designed to carry light loads at slower speeds)—were also started up with local, provincial, or GOI subsidies. The major princely states also began or extended their lines—sometimes as separate administrations as in the Nizam of Hyderabad's State Railway or sometimes as part of the State Railway System of India.

Thus, in the initial years of the 20th-century India's railroads were worked by thirty-three separate administrations. Based on ownership and management criteria, government placed these administrative units into one of ten categories: (1) state-owned lines worked by private companies; (2) state-owned and state-worked lines; (3) lines owned and worked by private companies guaranteed under old contracts; (4) lines owned and worked by private companies guaranteed under new contracts; (5) District Board Lines (short, local lines within a district and paid for by local cesses); (6) Assisted Companies' Lines (government assistance of various sorts but no guarantee); (7) princely state lines worked by private companies but owned by the princely state; (8) princely state lines worked by the GOI state railway system, that is, as part of the state system but owned by the princely state; (9) lines owned and worked by princely states; (10) lines in foreign territory (e.g., in French or Portuguese India).[19]

Proposed Reforms and the Creation of the Railway Board

What made the Indian situation unusual was not the number of administrative units—wherever privately owned railroads predominated a country of any size had multiple administrations—but rather the bewildering mixture of varieties of ownership and management. It is no wonder, therefore, that an important enquiry into India's railroads commissioned in 1901 had, as its first task, to report upon the future system under which India's railroads should be managed. Nor is it surprising that the sole commissioner, Thomas Roberston, recommended "root-and-branch reform" and the operation of India's railroads "more as commercial enterprises than they have been in the past."[20]

Few of Robertson's specific recommendations were accepted; some, most notably his recommendation to eliminate the state-managed lines and turn their operation over to the private companies, received a frosty reception and pointed criticism. In fact, the ink was barely dry on Robertson's report before a new, five-member committee of enquiry was constituted. Often known as the Mackay Committee (after its chair, J.L. Mackay), the "Committee on Indian Railway Finance and Administration" reported in 1908 (cmd. 4111).

Nonetheless, one of Robertson's recommendations—to abolish the Railway Branch of the Public Works Department and to replace it with a Railway Board exercising enhanced powers—was accepted and implemented in 1905. Building upon centralizing changes introduced in the 1880s and 1890s India's increasingly complicated railroads were given a more focused and more powerful leadership. The Railway Board as first constituted had three members, all men with extensive, senior-level railroad experience. The chief member, styled chairman (later changed to president, then to chief commissioner and, after 1947, back to chairman) exercised considerable power.

The Mackay Committee (whose report, on the whole, was better received) was asked, among other tasks, to consider whether the Railway Board operated satisfactorily, and, if it did not, to recommend improvements. The Mackay Committee stated that it was impossible for the board to function autonomously "as an authority outside the Government" so long as certain crucial decisions labeled as "deliberative"—broad policy or macro financial issues—had to be referred to the government. Because Robertson's root and branch reform had, for good reasons, been rejected it meant significant GOI involvement in railroad matters continued. Therefore, the Mackay Committee recommended certain measures to ensure board input at the highest levels when the GOI made railroad policy. At the same time, the committee recommended the GOI not to interfere when the board exercised the powers clearly delegated to it, that is, duties "administrative" in nature within the broad policy and financial constraints established by the government.

In 1921, the ten-member Acworth Committee (William M. Acworth, chair), perhaps the most influential of the many committees that enquired into railroad matters during the colonial period, found continuing problems with the working of the board. The report of the committee appointed by the secretary of state for India to enquire into the administration and working of Indian Railways (cmd. 1512; London, 1921, p. 36) found the commissioners "impressed with the disproportion between the importance of the railways financially and economically, and the position which the existing Government organisation assigns to the Department charged with their administration." Indeed, the Acworth Committee found the board still bedeviled by many of the problems—most notably GOI's interference in details of railway administration properly left to the board—the Mackay Committee had identified. More changes were recommended and identified that did strengthen the autonomy of the board within the proper sphere of its authority. Ironically, the Acworth Committee also found the board guilty of excessive attention to administrative details best left to the operating units. A more decentralized approach was recommended to free the board members to focus on broader concerns that affected the entire railroad system.

The changes that resulted in establishment of the Railway Board in 1905—and their subsequent modifications—represented the increasing emergence of a national rail system practising integrated cooperation and subject to central direction regardless of the difficulties and ambiguities present in the administrative policies and structures that emerged.

The Railway Board in the early 21st century, now directly responsible to its political boss the Minister of Railways and with its chief member holding a rank at the highest level of India's federal civil service, continues to provide executive direction to India's vast rail system and its 1.5 million employees.[21] Today, building upon changes introduced in the final decades of colonial rule, the board consists of a chairperson and seven members—no longer entirely male—plus others, styled "additional members" who take on more tightly defined portfolios (e.g., Additional Member Electrical Engineering)—who, in turn, command a vast bureaucracy of directors, assistant directors and so on down the line to numerous clerks, typists, messengers, etc.

This large administrative apparatus is housed in an impressive, multistoried building known as Rail Bhavan (literally "Rail House") located in New Delhi a short distance from the building in which the Indian Parliament convenes. One engaging observer of contemporary India's railroads refers to the Rail Bhavan as "Kafka's Railway Castle." He writes: "at various level the corridors open out and seem to run broad and unwavering to infinity. It is the same on every floor though each floor grows more carpeted and silent as you gain height."[22] Behind the doors on one hushed, red carpeted floor one finds the offices of the board members and other senior officers: big offices that reflect and reinforce the power the incumbents possess.

Of Machines and Men: The Railroads and their Employees

The gauge issue, the introduction of state-owned and state-operated railroads, and the many administrative-institutional innovations were the most important among the many developments that affected India's railroads between 1870 and 1905. Those developments show how railroad history requires the historian to deal with much more than the most visible part of railroad life, namely engines, carriages, and goods' wagons crossing landscapes on ribbons of steel track laid between stations great and small. The physical technologies and the people who operated them can almost disappear within an emphasis on political and administrative structures and decision making. But that would be wrong. If the broader structures and processes described above gave shape, direction, cooperation, and increased integration to India's railroads—in short created networks of increasing scope and density—then all of this would have been made possible because, at the operational interface of the physical technology and its human agents (be it a steam locomotive or a ticket machine, a signaling device or a lathe), real people made railed locomotion possible. Moreover, real people and/or their goods traveled across India in the trains whose routes and schedules—indeed everything—were determined and supervised by those located somewhere in the hierarchy of control and command described above. Railroads were all of the above and more than the sum of their respective parts.

Permanent railroad employees numbered 69,233 in 1870; 437,535 in 1905. Among the latter 6,320 were Europeans (despite the use of the term "European" these were almost entirely British) and 8,565 (2 percent) were Anglo-Indians. The overwhelming majority, 422,650 or 96.6 percent, were Indian. The "Anglo-Indians"—the Eurasian offspring of what initially had been Indian mothers and British fathers—had become, over time and to a considerable extent, a self-perpetuating, endogamous, that is, marrying within the community, population.[23] Anglo-Indians formed less than one-half of 1 percent of India's total population but provided 2 percent of the railroad employees; more tellingly, roughly 50 percent of all Anglo-Indians came to be supported by railway employment either directly or as a dependent of a railway employee.

What the gross employment figures do not reveal was the dominance of Europeans and Anglo-Indians in the higher and better-paid levels. Numerically, Indians always provided the overwhelming majority of railroad employees—and that number, as a percentage of the total, increased even as the total number of railway workers grew to 437,535 in 1905 (and onwards to 1,046,843 in 1947 when Indians comprised almost 99 percent of the total). However, almost to the end of colonial rule most of the best jobs—especially the well-paid managerial-level positions—were held disproportionately by Europeans and Anglo-Indians: a disproportionate presence

deeply evident in the period 1870–1905 and directly attributable to the fact that India's railroads were colonial railroads serving colonial purposes.

At the beginning of India's railroad age there were no indigenous workers trained to operate and maintain steam locomotives, construct wagons and carriages, or to administer rail networks extending along hundreds of miles of track. The use of foreign experts was justified in the pioneering decades until enough Indians were trained to takeover the skilled and supervisory positions—a process that did happen in 19th century Japan although Japan was not, significantly, under direct colonial rule. But in India the European presence, soon joined by Anglo-Indians, increased and continued to increase (through the 1920s) as a total number (even though declining as a percentage of the total employment) despite the recognition by railroad authorities that European workers were expensive and sometimes unreliable (e.g., more likely to become ill).

Wages and salaries above British levels plus travel costs had to be offered to induce skilled railroad workers to go to India. Among the officers, younger men could find a position in India many grades senior to that which they might obtain on a British railroad. India became a stepping stone: the ambitious Briton went young to India, got a responsible position, and then left to pursue his career elsewhere in the British Empire or to return to a good job with a British railroad company. One historian called some of them "birds of passage" although, as the colonial period moved into its last decades, India ceased to provide the same level of employment opportunities for young men from Britain.[24]

Nonetheless, the companies and the GOI recognized the higher costs European recruitment incurred. Employment of Indians was encouraged and slowly increased although, where a position like engine driver was concerned, moves to increase the Indian presence had to deal with prejudice. "It will take time to qualify them for the more arduous duties of locomotive drivers, which require coolness, courage, and decision ..." wrote Juland Danvers, the government director of Indian Railways, in 1877 although he admitted that "some had already shown themselves to be equal to such employment ..."[25] But, he continued, "a certain proportion of European officers and servants will always be necessary ..."[26] Why that should be so was clearly stated by another high official writing decades later. Indian railways, he said, were a business but they were also necessary to maintain "the security of the country both from a military point of view and from the point of internal security, and that had to be taken into account in dealing with the recruitment of staff."[27]

This brings us back to the Anglo-Indians who helped to reconcile the need for economy and security. What the railroad authorities quickly recognized was that Anglo-Indians provided ideal substitutes for the Europeans. Anglo-Indians worked for lower wages, they were loyal to the colonial connection and, as India-born, they were better adapted to the medical and

Table 4.1
Railroad Workforce on December 31, 1890 by Category and Parentage

	General Administration	Traffic & Telegraph	Engineering	Locomotive & Carriage Shops	Total
European	373	1,514	491	2,229	4,607
Anglo-Indian	485	2,121	505	2,562	5,673
Indian	13,785	53,101	119,017	66,507	252,413
Total	14,646	56,736	120,013	71,298	262,693

Source: Parliamentary Papers, 1890–91, pp. 130–131.

climatological conditions of the subcontinent. Thus, the railroads came to nurture the Anglo-Indian community whose members came to have an important presence in some of the skilled positions—especially engine drivers and guards—and the lower and mid-level ranks of the officers. As late as the 1990s an observer of the Anglo-Indians of Calcutta wrote: "The fact that your family had worked on the railways is also taken as proof of your British lineage. It gives you access to a kind of British authenticity that non-railway Anglo-Indians do not possess."[28] In colonial times, rail authorities checked the antecedents of Anglo-Indians before employment.[29]

If we take a date roughly halfway through the period 1870–1905, namely 1890, we find the railroad workforce to be large, dispersed throughout India albeit with substantial concentrations of workers at the locations of the large workshops, and riven with many kinds of distinctions and groups. There is the European/Anglo-Indian/Indian divide—a distinction labeled racial in the documents of the day but better called parentage—described above. Some castes and communities had turned particular railroad occupations into their special preserves. After labor unrest and a serious strike on the GIPR in the late 1890s no less a figure than Lord Curzon, the viceroy (1899–1905) wrote in May 1899 that "it has been folly to appoint as signallers so large a proportion of Brahmans; and that in the future the Railways must mix up the races and religions . . ."[30] And, of course, there were the seemingly innumerable occupations and grade levels into which the workforce of any 19th-century railroad—though perhaps magnified in the Indian context—was divided. Table 4.1 provides data for a further examination of some of these distinctions.

The most numerous category was engineering, where one found the largely unskilled or semiskilled gang labor that maintained and reconstructed the permanent way and buildings. Almost half the workers, 45.7 percent of the

total, were placed in this category. General administration encompassed a small 5.6 percent of the total. It included audit, accounts, stores, medical services, printing, and police but it was not the location of most officers: they, junior or senior, were listed under their functional responsibilities, for example, a traffic superintendent would be part of traffic & telegraph; a civil engineer in charge of a stretch of line would be in engineering. Traffic & telegraph and the shops together included 48.7 percent of all the railroad employees. These were the categories containing the more numerous of the skilled positions: drivers and guards in traffic and the highly skilled workers in the workshops. Not surprisingly, Europeans and Anglo-Indians were over represented in these categories: 6.4 percent of traffic and telegraph; 6.7 percent in the workshops.

Workshops were built throughout India.[31] They came in different sizes: massive complexes of buildings and heavy machinery needed for major repairs to locomotives and for rolling stock construction, where thousands of people were employed daily; modest yet numerous establishments employing, at the most, a few hundred or less to conduct minor repairs or to provide the daily maintenance that a steam locomotive required (and steam predominated in India through the 1970s). The latter were called locomotive sheds and were needed until steam gave way fully to electric and diesel powered locomotives. Steam engines went to the sheds at the end of their daily runs (hence these sheds were often called running sheds and had traffic, i.e., running, staff—drivers, firemen, guards, etc.—as well as repair and maintenance workers) to have their fireboxes cleaned, water and coal taken aboard, and oiling and minor repairs undertaken in preparation for the following day's run.[32] Steam engines required daily attention in ways that the succeeding technologies did not. A running shed had fewer employees, a less diversified range of employee skills than the major locomotive shops, and a more limited range of tools and machinery. Nonetheless, they were little workshops.

The big workshop complexes command our attention for many reasons. They were early centers of the heavy engineering industry in India; they were crucibles of technology transfer; they employed substantial numbers of people in ways that significantly affected local economies; they were, in short, essential to the railroads and affected the making of modern India in many dimensions.

By way of example, the workshops at Lahore dated from the early 1860s when the Sind, Punjab, and Delhi Railway Company, discussed in Chapter 3, began its operations. Lahore and Delhi had a through connection by 1870. Lahore to Karachi were linked in 1878 as the result of the completion of the Indus Valley State Railway, and the Punjab Northern State Railway joined Lahore and Peshawar in 1883. Thus, by 1886 when the unified, government-owned and government-operated North Western State Railway (whose name was soon reduced to the North Western Railway, hereafter

the NWR) was created by amalgamating most of the railways in Punjab and Sind the workshops of Lahore repaired locomotives and built and repaired carriages and wagons for a far flung network whose route miles totaled nearly 2,000.[33]

The Lahore workshop complex was large. Initially located in the area of the city known as Naulakha the workshops and the adjoining railway station covered an area of approximately 126 acres. Some 2,000 men found regular work in the shops in the early 1880s growing to nearly 4,000 men by the early 1890s. The continued expansion of the NWR eventually forced the Lahore workshops to move to a larger site. A bigger, better-equipped physical plant was required to repair the engines and to repair and construct the rolling stock and other equipment of a railway system which exceeded 4,000 miles in 1905; a system with 756 engines, 2,399 coaches, 11,622 goods vehicles, and more than 63,000 employees.[34] An area of some 1,000 acres was acquired on the eastern edge of Lahore where, at the Moghulpura site, new carriage and wagon shops were opened in 1910 and new locomotive shops, begun in 1910, opened in 1914.

An account of the Lahore shops written in the 1870s included the following: "the tourist or stranger who has only seen the natives in passing through the bazars may here see them under a new aspect, busily employed in the care of huge machines which require constant vigilance and intelligent adjustment, working with an accuracy formerly undreamed of, and handling heavy weights with something approaching the muscular vigour of the Englishman."[35] The workforce included "a large number of Europeans, Eurasians and Parsis" among whom were twenty-five or so European foremen.[36] At the large workshops most pronouncedly but also elsewhere where significant numbers of European and Anglo-Indian workers were located one found another manifestation of the colonial character of India's railroads: the railroad colony. Identified by one historian as the only sustained example of colonization (i.e., the presence of colonists—long-term, nonindigeneous inhabitants if not quite "settlers") by the British in India the railway colonies were places where—almost exclusively in the earlier years—the "foreign" workers lived in enclaves separate from India and Indians.[37] Located adjacent to major stations and workshops the colonies provided housing graded according to rank, recreational facilities, churches, and schools, all in pleasant, neat, well-ordered surroundings.

Jamalpur, the location of the EIR's main workshops (daily employment in 1891 was 4,000) in rural eastern Bihar, was the quintessential railway colony. With the formidable workshops at one end and the railwaymen's institute at the other where the "white," off-duty workers and their families could play tennis, billiards, or card games—or listen to a brass band on Sundays—the colony had its grid of King's Road, Prince's Road, Queen's Road, Victoria Road, Albert Road, Church Street, and Steam Road bisecting a colony "laid out with military precision to each house its just

share of garden, its red brick path, its growth of tree, and its neat little wicker gate . . ." providing an overall aspect like a slightly too formal English village.[38]

The Viceroy visited Jamalpur in 1897. As a memento he was given a substantial photo album. This album "Presented to His Excellency the Earl of Elgin and Kincardine P.C., LL.D. G.M.S.I., G.M.I.E., Viceroy and Governor General of India as a Memento of His Excellency's Visit to the East Indian Railway Workshop at Jamalpur, November 30th 1897" can be viewed today in the British Library in London.[39] The first six photos provide a sequence of views that can be folded-out lengthwise to provide a panoramic view of the various shops: a panorama little different from what I saw when I visited the Jamalpur workshops in the early 1980s. Jamalpur was sometimes called the Crewe (the paradigmatic railway workshop and accompanying railroad town in England) of India, a comparison made explicitly in the album which also contained a plan of the workshops at Crewe. Many aspects of India's railroads in the colonial period were borrowed from, measured against, or compared to, British practices, British machines, and British workshops.

Nonetheless, creatures of a colonial project though they were, the railroad employees were one of the most significant, direct consequences of railroad development in South Asia. Whatever their job had been—porter or traffic superintendent, workshop mechanic or engine driver, ticket clerk or accountant—the railway employees were members of the single largest (i.e., within the same industry) and spatially most dispersed body of modern-sector employees in colonial and postcolonial India. Two economists write that from "1850 to 1940, the construction, maintenance, and operation of the railways employed at least one man for every two employed in all branches of modern industry."[40]

Some General Results, 1870–1905

Thus, despite being derivative and developed primarily as a colonial project designed to support British interests and objectives in South Asia, the railroads became by 1905 a formidable presence in India and in the lives of many South Asians. Numbers sometimes tell us a great deal about what happened, or at least set the stage for further investigation. For the reporting year, 1905, India's railroads carried 52,506,000 net tons of goods. The average ton traveled 167.9 miles. The cumulative total since 1882 (earlier figures not available) of net ton miles of goods (summed weight of all freight multiplied by the distance carried) reached 8,815,796,000 at the end of 1905. In the same year, 1905, 231,283,000 passengers were transported with the miles traveled by the average passenger reaching 41.07. Cumulatively, total passenger miles, 1882–1905, reached 9,499,937,000.

The cold, abstract figures both reveal an explosion of spatial mobility for people and goods in South Asia and obscure the daily realities of that mobility: the men and women at Mokameh Ghat laboriously transshipping goods from the broad gauge lines of the EIR to the meter gauge BNWR and the reverse; workers traveling daily to and from the Jamalpur workshops and their homes in surrounding villages; the same workers repairing locomotives that yet other workers drove and fired along the network of EIR lines. Or perhaps one must think of the smooth passage of a regiment of British troops moving swiftly from disembarkation at the great port of Bombay to a cantonment close to the Afghan frontier. There is much to be considered as one tries to transform historical statistics into an historical tapestry full of color, people, and added meaning. The next chapter makes such an attempt.

CHAPTER 5

Taking Stock, ca. 1905

By 1905, railroads had operated in South Asia for over 50 years and had helped to bring about many changes. Future decades intensified and modified those processes of change, but, on the whole, a new India had begun to take clear shape. Indeed, the engines of change can be seen more clearly in the decades before 1905 precisely because the picture was still incomplete: the broad brush, main features predominated; the engines with their great plumes of smoke were highly visible; subtle shadings and less obvious changes were still emerging. The turn of the century, therefore, is a good time to take stock and to describe some of the many changes the railroads had helped to put into motion.

Fittingly, the first motion picture shown in India at Bombay in 1898 had a railroad setting. The jerky, silent, short, black and white film, "Train Arriving at Bombay Station" symbolized the accumulating revolution in transportation and communication centered on the railroads. Jump forward a couple of decades and one could watch films—themselves an important aspect of the communication revolution—made by the railroad companies to advertise their services or feature films in which trains figured prominently.

Most obviously, the railroads had transformed the movement of people and goods across India's regions, and beyond as a subcontinental network of lines took shape that connected India's great port cities and inland centers with one another and with their increasingly distant hinterlands. The borders of the subcontinent had been reached as lines penetrated the rugged terrain of the Indo-Afghan borderlands, the hills of Assam, and the wet jungle of eastern Bengal. Map 6 displays the network of lines as it existed in 1905. The statistics recounted at the end of the last chapter clearly show that the railroads had changed transportation in South Asia in a fundamental

way. Time and space may not have been fully annihilated but Deloche was correct: the pace of transport had increased in South Asia in the last half of the 19th century at a rate "unimaginable" prior to the introduction of the railroads.

Passengers of Many Sorts

But what did this mean for specific groups and individuals? What did these developments mean for India? Let us begin with passengers: they had the capacity to bequeath to posterity something of what they experienced; they became the single most important "commodity" transported by the railroads. The number of passengers carried annually grew by 189 percent between 1871 and 1881 and 234 percent between 1882 and 1902.[1] The comparable figures for growth in tonnage of goods carried annually was 277 percent and 207 percent. In short, passenger-use grew faster in the later period and passengers provided an increased share of the earnings of India's railroads: roughly 30 percent of the total at the beginning of the 20th century and roughly the same at the start of the 21st century.[2]

Military personnel were among those passengers. The expectations of Dalhousie and others that the railroads would enhance colonial security by enabling troops to move quickly and in large numbers to trouble spots and to the frontiers were realized. Even a slow deployment was considerably quicker than in the pre-railroad era. When disturbances led by the Kukas occurred in Punjab in January 1872, a seemingly lengthy 4 days were needed to move a mountain battery of artillery, 100 cavalrymen, a regiment of British infantry, and a regiment of Gurkhas 161 miles from Delhi to Ambala. Failure of the bridge over the Beas River caused a delay—but, even so, it was quick by historical standards. However, during the Second Anglo-Afghan War (1878–1880) a smooth-running deployment saw the British concentrating large numbers of soldiers and all their equipment, food supplies, horses, etc. on the Afghan frontier. At the height of the deployment eight special troop trains per day carried 4,000 men with all their guns, supplies, horses, baggage, and stores through Punjab. Occasionally, however, troop movements by train could lead to tragedy. Thirty-two British soldiers died from heat stroke on a North Western Railways (NWR) troop train crossing the Sind Desert in the summer of 1915.

European and Eurasian railroad employees contributed to the security of British rule in India through their required membership in a militia force known as the "Railway Volunteers"—a military force from which Indians were deliberately excluded. The "Volunteers" attended annual encampments where they received rudimentary military training. The railroads also made other contributions to colonial security. An armored train was built and outfitted with artillery pieces and machine guns at the Lahore

workshops in December 1887. Kipling witnessed the successful test firing of its armament, and reported that if the Government of India (GOI) ever decided to build armored trains on a regular basis the Lahore shops stood proven ready. Kipling often incorporated his real-life observations into his fiction. The train reappeared in *The Courting of Dinah Shadd* as "an armoured train which carried nothing more deadly than a twenty-five pounder Armstrong, two Nordenfelts, and a few score volunteers, all cased in three-eighths-inch boiler plate."[3]

Indians enthusiastically took to train travel from the start. This confounded the arguments made by some who suggested that considerations of caste and religion would lead many South Asians to shun train travel because they would not agree to the close personal proximity sitting or standing in the coaches required. Women for reasons of modesty or the demands of seclusion were expected to be particularly resistant to rail travel. Others argued that poverty would make travel by train impossible for all but the well-to-do. In the event, many of all castes, classes, and gender traveled by train. Third-class passengers quickly became and remained the most numerous passengers and the railroads' largest source of revenue from passenger traffic. High volumes—87 percent of passengers carried in 1902 traveled in third-class—more than compensated for low fares.

Examples of early, mass adoption of rail travel abound. 284,806 passengers, not including infants, reportedly traveled between Lahore and Amritsar between the line opening in early 1862 and late January 1863.[4] Crowded carriages "brimful of their human freight" waited at the Lahore station in June of 1862 for the 4:00 PM departure to Amritsar. Their presence well in advance of the departure time led a writer in the English-language newspaper the *Lahore Chronicle* to observe: "people are learning punctuality, that time and tide in the shape of that grim monster, the locomotive—aptly called 'John Lawrence'—waits for no man, leastways for Rambuksh stopping to take a whiff of his hookah."[5] Around the same time Robert Cust, a British administrator, wrote: "our railway is now in full force, and Amritsar is only one hour and a half distant. 1300 Sikhs went off to bathe in the sacred tank [at the Golden Temple in Amritsar, Sikhism's premier shrine] on one day last week: the people thoroughly enjoy it. I may yet see Lahore and Calcutta 1,200 miles connected: only 250 miles are unprovided for."[6] A little over a year later the Sind, Punjab, and Delhi Railway (SP&DR) ran special trains from Amritsar to carry people to a religious festival, the *bhaddarkal mela*, at Niazbeg, some 7 miles southeast of Lahore.[7]

The results were the same elsewhere. Those who traveled on the inaugural train from Bombay to Thana, described in Chapter 1, were followed by a great many more: 450,000 in the first year alone. Three thousand people applied to ride the first train in Bengal, Howrah to Hooghly, in August of 1854. There was room only for a few hundred. Seven thousand a week on an average traveled the same route during the first 16 weeks of operation rising

to 12,000 a week when the open line extended to Raniganj.[8] "Nothing strikes a person revisiting India after an absence of some years, than the way in which the natives of Hindostan take to travelling by Railways" wrote a correspondent to the Madras-based, English-language newspaper *The Athenaeum and Daily News*, March 20, 1878. And then there were really big numbers: 231,283,000 total number of passengers carried in 1905 mentioned in the last chapter and the one billion figure achieved for the first time in the reporting year 1946–1947. Many of these people traveled in uncomfortable conditions but travel they did.

In fact, the passenger figures understate the numbers actually transported. Increasingly in the colonial portion of the 20th century ticketless travel became common—justified by some as an act of anticolonial protest—and the practice has continued to bedevil Indian Railways (IR) in the postcolonial era. The *Indian Railways Year Book 2001–2002* states on page 49 that the "drive against ticketless travel was sustained at a high pitch during 2001–2002" with many spot checks being carried out to catch offenders. It may be a losing battle. I once traveled without a ticket in 1967 on the evening train from Batala to Amritsar. It was a short ride—less than an hour—and I wanted to buy a ticket. However, no ticket office was open, no conductor available, and no ticket inspector in sight. None among the crush of Punjabis squished into my third-class carriage seemed to have a ticket: a fact that concerned no one except me. As for my more recent experiences on the crowded suburban lines of Greater Mumbai I can only say I had a ticket but my impression was others did not—and catching them in the crush of commuter traffic must be an almost impossible task. The situation within most of the carriages of the long distance trains is much more controlled. Seats and/or sleeping births are assigned and carefully checked.

Consequences

Extensive use (with or without tickets), time discipline, pilgrimage, and a colonial administrator with a vision of network development—the through connection of Lahore and Calcutta (which became a reality in 1870)—were present in the examples mentioned above. One could multiply the examples many times over: to illustrate the many uses to which railed transportation was put in the half-century following 1853; and to illustrate some of the consequences, intended and unintended, of those multiple uses.

Almost immediately the lives of Europeans and their families in India—be they officials, military men, missionaries, or businessmen—were made easier and their presence was made more efficient regardless of who they were, although administrators and soldiers predominated. Soon after a stretch of line opened in August 1854, the wife of chaplain to the Anglican Bishop of Calcutta wrote to a friend in England that she was delighted to hear and to

see a train again. It reminded her vividly of England. The train, she wrote, was convenient for the Bishop who traveled up and down the short line to and from his residence located on the river outside Calcutta.[9] The goodly bishop was an early example of the train commuters whose daily number today is in the multiple of hundreds of thousands in the great urban conglomerations of India. Trains soon enabled Christian missionaries to travel faster and more frequently and to take more furloughs to distant Britain, Canada, or the United States. The same railroads made it easier to consult church authorities—or the authorities to go on tours of inspection—thus reducing the autonomy of the missionary in the field. Like British civil and military officials, the missionaries discovered that improved communication could be a mixed blessing: easier travel also meant more control from one's superiors.

An official could reach the site of a new posting within days rather than the previous weeks or months. High officials could undertake extended tours in their official capacities, or even take pleasure tours to view the sights and oriental curiosities, although, for a high official, never without public display or meetings with other officials. Michael Furnell described a trip in 1873 undertaken by Lord Hobart, governor of Madras Presidency.[10] The governor and his retinue left Madras on January 9 and were back in Madras on February 7 when their train steamed into Madras' new Central Railway Station ending a "month's pleasure trip, unalloyed by a single contretemps or misadventure ..." Previously, on January 21, 1873, the entourage had been near Jamalpur after a stop of many days in Calcutta (which had been reached by boat from Madras) reading in comfortable carriages that moved "through the country at a fair rate. It was refreshingly cool, there was no dust, and the changing panorama of scenery most exhilarating. At stated periods our breakfast, luncheon and dinner were served at some station, by those most admirable caters Messrs. Kellner and Co. . . ." The train reached Benares at 7:00 PM. A stop in Benares was followed by a 10:30 PM arrival at Agra on January 23. They slept in their comfortable carriages and awoke in the morning to see a "glorious building" distant but "quite clear in the dull morning light." It was the Taj Mahal. The author's only complaint about North India was the nighttime temperature. Quite unlike Madras he and his companions found it cold—as indeed it is in North India in January and February—with multiple blankets barely sufficient to keep them warm in the unheated railroad carriage.

Pilgrims

At one point (January 28) during the return journey the train carrying Lord Hobart's party stopped near Allahabad and took on a large number of pilgrims. "It was a great crowd, for they had been to worship at the junction of the Ganges and the Jumna, a most holy affair." "The confusion, noise,

and apparent helplessness of the people surpassed anything I have ever seen." The majority of people were elderly men and women with each old woman carrying an "enormous bundle" on her back. People and bundles were packed forcefully into the carriages by the British guard until the train "swallowed the crowd ... like a gorged boa constrictor." The story ends with the author saying to the guard that pilgrims seem to be a good deal of bother to which the guard replied: " You may say so! Pilgrims is worse than osses [horses], Sir."

Pilgrimage has long been, and remains, a central practice of Hinduism and Islam. One enumeration in 1928 identified 520 religious fairs, each with an annual attendance exceeding 10,000 pilgrims and 37 with over 100,000.[11] To journey to a sacred place and/or to a religious festival (with the latter usually being held at the former) is one of the most popular religious practices among South Asians. Virtually all peregrinologists agree: railroads and other forms of mass transportation (bus tours to pilgrimage sites recently have become popular) significantly affected pilgrimage in South Asia.[12] One authority writing in the early 1970s stated that more people in India were visiting sacred places than ever before. He went on to say that Hindus had not become more religious but rather that, "modern means of mass transportation have made it possible for larger numbers of individuals to undertake pilgrimages."[13] A 1995 comparative study of pilgrimage in the world religions made the same point: better transport systems had "considerably boosted" pilgrimage in India during the past two centuries.[14] Earlier in the 20th century a series of committees set up by the GOI made a similar point in stronger language. The Report of the Pilgrim Committee United Provinces, 1913, detailed "the enormous changes effected by the railways . . ." while the report from the Bihar and Orissa Committee said, "railways have revolutionised pilgrim traffic."

Some lines were routed through pilgrimage sites and, later, the railroad companies mounted advertising campaigns to encourage people to undertake pilgrimages by train. As the prominent historian C.A. Bayly writes: "The ritual centres also benefitted from the creation of an all-India railway network after 1850."[15] The consul-general of the United States in India reported the presence of 2 million pilgrims at Allahabad during the *kumbha mela* in 1882.[16] The Oudh and Rohilkhand Railway transported many of the 250,000 pilgrims that jammed into the limited bathing area at Hardwar on March 26 and 28, 1892.[17] As many as 300,000 railway tickets were booked between Calcutta (Howrah station) and the major pilgrimage site in Orissa, Puri, in the first year, 1901, a direct rail link became available. In 1918, the then definitive *Encyclopaedia of Religion and Ethics* (Vol. X, p. 24) stated: "Nothing strikes a new-comer to the country [India] more than the crowds of pilgrims traveling by road or rail toward some holy river, the local abode of some god or godling, the tomb of some saint or martyr.[18]

The *kumbha mela* at Hardwar in the spring of 1927 saw 143 inward and 206 outward special trains move on a single line of the main line and its branch to Hardwar. They transported 692,000 inward and outward passengers within 40 days, of whom half traveled within a ten-day period.[19]

Thus, thanks to the trains many more people could undertake more pilgrimages to more distant sites, and do so in less time. T. N. Atre, a minor Indian official in the service of the colonial state and well-situated to observe village life, wrote an account in Marathi of life in rural Bombay Presidency in the early years of the 20th century.[20] He writes that in the "old days" a pilgrimage to Benares was rigorous and life-threatening hence only a "select few" undertook the "Grand Pilgrimage" (to Benares, Prayag, and Gaya). "[N]ow there is the railway, north and south are like front and backyards, and the railway fare seems to be within everybody's reach." The number of people undertaking the grand pilgrimage had risen tremendously. He then went on to decry the conditions at the holy places, the commercialization of pilgrimage, the venality of many priests and their hangers-on, and the continuing health dangers pilgrims faced. Nonetheless, he concluded by referring again to "the continuously growing popularity of the Grand Pilgrimage amongst villagers . . ."

The experience of the journey to the pilgrimage site—the journey was an inseparable part of the practice of pilgrimage—changed. Many weeks or longer of travel by bullock cart and foot changed to a train journey lasting a few days at the most. Particularly when large numbers of pilgrims converged on the same site during a major religious festival the conditions within and without the railroad carriages could be very bad: severely overcrowded, sometimes extremely hot, unlighted, and lacking adequate water and toilet facilities where they existed at all. Shortages of third-class carriages on such occasions led the railroads to herd the hapless pilgrims—among whom many were old and/or women—into dirty goods' wagons normally used to transport livestock and other commodities. The latter, of course, had no windows or other basic amenities. Iron wagons—overly efficient conductors of heat or cold as the season or time of day dictated—were the worst.

The hardship of the pilgrims did not end when they were outside the carriages. The increasingly numerous pilgrims came to the close attention of the colonial authorities. Pilgrimage became associated with the etiology and transmission of epidemic disease and a menace to public health. The pilgrim, colonial authorities believed, had to be observed and controlled. The confined, concentrated nature of railroad travel—and for the pilgrim in a goods' wagon it must have been mobile incarceration—made the pilgrim's train the easy object of government control. Pens, it was suggested, were needed at some arrival and departure sites to control the crush of pilgrims and to channel movement on and off the trains.

When fears of epidemic disease were pronounced, the control of railway passengers, pilgrims or not, became more stringent and personally intrusive.

Forced vaccination, forced disinfection, and forced detention took place. Ironically, (for railroads were held to help spread disease yet people used them to flee from disease) such measures affected those who tried to leave plague-stricken areas. Several hundred thousand, for example, crowded aboard special trains departing from Bombay city in the midst of a severe outbreak of bubonic plague in 1897.[21] As one American scholar evocatively puts it: "plague rode the rails."[22] Without doubt, one of the unintended effects of railroad transportation was the facilitation of disease transmission—not quite as fast as air transportation that permits new strains of the influenza virus to spread around the globe in a matter of months but all too fast nonetheless. Gandhi got it right in *Hind Swaraj*: railroads made people more mobile and thus spread germs; a previously less mobile India "had natural segregation."

Conditions of Train Travel

Passengers in different classes of carriage had vastly different surroundings. Third-class passengers, overwhelmingly Indian, experienced the worst conditions and were most affected by the surveillance and control exercised by the authorities. Complaints about the conditions of travel in the third class began almost from the day railroad operations commenced in India. The conditions experienced by pilgrims were particularly bad instances of what many Indians more generally deplored. And deplore they did: in news columns and letters to the editor in newspapers published in English and in the languages of India; in travel accounts; in formal petitions and memorials to railway authorities and to colonial administrators; in evidence given in writing or orally to committees of enquiry; and, no doubt, sometimes in the unrecorded, angry word and gesture.

The British Indian Association of the North Western Provinces sent "A Petition to the British Government praying for certain reforms in the Railway arrangements for the convenience of Native Passengers" in 1866.[23] Fourteen pages of formal, respectful English are followed by eighteen pages of the same material in Urdu. The "humble petition" begins by recognizing "the numerous material and moral benefits" railroads had brought to India and then states: "Your Excellency is aware that Railway travelling in regard to Natives has for a long time been full of the most bitter and serious grievances." The petitioners hope His Excellency (the viceroy) will relieve "the poor passengers" from their "groaning and suffering" by responding to the requests they "urge on behalf of ourselves and the poorer masses of our fellow-countrymen." What was needed was proper shelter at stations, appropriate restaurant facilities for all types of people, medical facilities for in-transit emergencies, and the elimination of the "unfailing bad treatment of Native passengers of all classes and grades." The petition stressed the

particular problems faced by women passengers, and the outrages experienced by "Native gentlemen of birth and respectability" in second-class carriages perpetrated by "a low class of Europeans."

The Urdu language *Koh-i-Nur* newspaper of March 12, 1870, provided similar complaints. The writer claimed to have seen everything with his own eyes but, he wrote, the "Station Masters will not listen to any complaints, and it seems to him that the Agent of the Punjab Railway must be ignorant of it, or such a state of affairs could not exist."[24] Railway conditions were "very hard on travellers." Women travelers in particular were improperly treated both in the facilities available to them and in the sometimes shameful ways they were treated by the subordinate staff. There were no commodes in third-class carriages (nor in second class)—a source of illness and a grave inconvenience to all, but especially to women. The lack of lights in third-class carriages meant many articles got left behind because travelers could not find their belongings. Drinking water at stations often was not available. Platform vendors with exclusive contracts from the Railway Company used their monopolies to charge prices that utterly ruined the customers. Women and children faced "considerable inconvenience" because of poor luggage handling arrangements.

The complaints of Indians were justified, continuous, and well documented. In 1901, the GOI decided to make sure the railroads saw the complaints that appeared in the Indian newspapers.[25] The GOI ordered printed extracts from the official surveillance translations sent to the railroad administrations. Apparently, the railroad authorities, the hope of the writer in the *Koh-i-Nur* in March 1870 notwithstanding, still had not got the message. Lest we think the reoccurring complaints by Indians were overblown, consider the following written by a European in 1911. Obliquely, the writer testifies to the third-class hardships by never mentioning them while complaining a great deal about the second-class travel which Europeans are not expected to use—"its bad form for a saheb"—but often must "from necessity."[26] Finally, as late as 1929 Mahatma Gandhi complained about "dirty and unkempt" third-class carriages and the need for "more and better carriages."[27] Gandhi considered it important for people like himself "to complain against the indifference on the part of authorities to the well-being of third-class passengers" but anticipated no major improvement until the passengers themselves energetically demanded redress. Perhaps, in 1929, the railroad authorities still had not got the message conveyed repeatedly from the 1860s onward, or perhaps the authorities were, in fact, indifferent.

The ill-treatment of Indian passengers by lower-level European and Eurasian railroad employees—station masters, guards, policeman—or by poorer European and Eurasian travelers (more likely to be encountered in second class) received frequent mention. At its worst the ill-treatment smacked of racism and, regardless of its origins, was deeply resented by Indians. Humiliation and harsh handling was more annoying than the

physical defects within the carriages, or at the stations. Something of European/Eurasian attitudes toward Indians was caught in the statement quoted above when the guard said pilgrims were worse than horses—"osses, Sir." We also have the testimony of no less a figure than Rudyard Kipling. He wrote Indians could be annoying train passengers, "stupid and troublesome" he wrote in 1884, but that "they ought to be treated more like human beings than they are" rather than with the "unnecessary rudeness and truculence of manner" that had "grown into a confirmed habit with many of the European and Eurasian subordinates on our Railways . . ."[28]

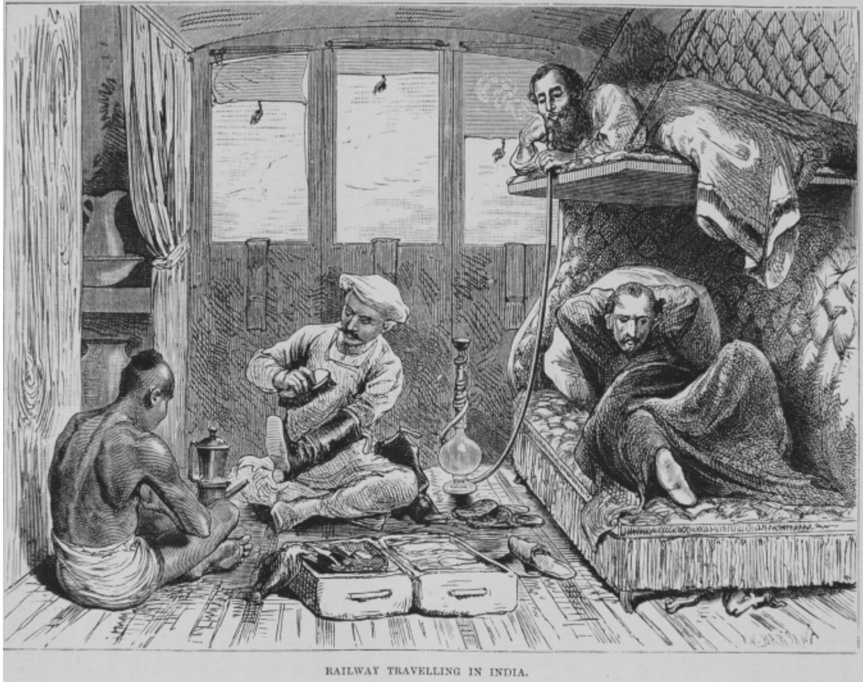
Bad habits died hard. In 1929, Gandhi's son, Devadas, was asked to leave a compartment when two European women complained he was not properly dressed (the young Gandhi wore what by then was standard clothing for an Indian nationalist—a full khadi dhoti, vest, and cap). An argument ensued. The guard called the stationmaster and, in the end, the police did not arrest Devdas. But, as Gandhi wrote, "race and colour prejudice," die hard.[29]

An amusing yet hard-edged anecdote captures the Indo-British tensions that arose in the carriages.[30] A distinguished Indian, Sir Asutosh Mukherjee (1864–1924), the first Indian to serve as chief justice of the Calcutta High Court (1920), was traveling in a first-class coach (as he had every right to do). A British passenger, perhaps a planter or a jute mill manager, boarded the train and reluctantly took the upper berth in Mukherjee's compartment. He did not like sharing the compartment with the sleeping "native" and, when he saw Mukherjee's sandals he threw them out of the moving train. When Mukherjee awoke and saw his sandals gone he guessed what had happened. He then took the sleeping Briton's jacket from its peg and threw it out the window. The Briton searched for his jacket in the morning. He asked Sir Asutosh if he knew where it was. The calm reply was: "Your coat has gone to fetch my slippers." The train then pulled into a station, others appeared, and Justice Mukherjee's identity was revealed before the confrontation escalated.

First-class travel in India was a comfortable experience. The passenger found himself or herself transported in a commodious, uncrowded carriage served by courteous staff. Mark Twain traveled extensively in India by train in 1896. He described his first-class accommodation as follows. "On each side of the car, and running fore and aft, was a broad leather covered sofa—to sit on in the day and sleep on at night. Over each sofa hung, by straps, a wide, flat, leather-covered shelf—to sleep on. In the daytime you can hitch it up against the wall, out of the way—and then you have a big, unencumbered, and most comfortable room to spread out in. No car in any country is quite its equal for comfort (and privacy) I think. For usually there are but two persons in it; and even when there are four there is but little sense of impaired privacy."[31]

Figure 5.1 provides a view of a first-class carriage as seen by a French traveler in India some 30 years before Mark Twain's visit. The Frenchman,

Figure 5.1
Interior of a First Class Carriage, Nineteenth Century. *Source:* Louis Rousselet, *India and Its Native Princes. Travels in Central India and in the Presidencies of Bombay and Bengal* (new ed.; London: Bickers & Son, 1882).



Monsieur Rousselet, wrote about rail "travel surrounded by all the comforts so essential" in India. He traveled an "immense distance with comparatively little fatigue—sleeping at night on a comfortable little bed, and walking up and down in my carriage during the day."[32] His visit to India extended from 1863–1868, so his account testifies to how quickly the railroad had conquered Indian distances.

First-class refreshment rooms at the stations usually provided good food in clean, orderly surroundings. In 1910–1911 Dhond Junction on the south-west line of the Great Indian Peninsula Railway (GIPR) offered a "spic-and-span room, clean linen, shining silver, a well thought out menu (whether it be for breakfast, tiffin or dinner) excellently cooked and smartly served . . ."[33] For decades, in-transit meals for higher-class passengers were provided by an advance ordering system: one placed an order with the carriage attendant, the order was telegraphed ahead to a future station, and the meal brought to the passenger when the train stopped at that station. Subsequently, on

Table 5.1
Killed or Injured in Accidents, 1901–1905

Year	Killed	Injured
1901	3	47
1902	127	184
1903	50	116
1904	11	83
1905	3	140
Total	194	570

Source: Administration Report on the Railways in India for the calendar year 1905, p. 19.

some routes, dining cars were added to the trains where people could eat their meals in considerable style.

Accidents

One frightening experience potentially shared by all passengers occurred when trains had accidents. Of course, goods trains also had accidents but they caused few deaths. The railroads of India have had their share of accidents, and continue to do so at the rate of roughly 300 a year. As we know from very recent events in Britain, Germany, and Japan serious railroad accidents can occur wherever trains operate. It must also be said that train travel everywhere is a safe mode of transportation. Recent disasters notwithstanding, train travel has become safer.

Nonetheless, accidents of all kinds occur and India had some major ones throughout the period covered by this book.[34] However, and it is precisely because accidents are just that, accidents, and are not predictable to a high level of probability that their incidence and accompanying death and injury toll vary greatly from year to year. This fact is well illustrated in Table 5.1. In 1901, 50 people were killed or injured; in 1902 the number jumped to 311; decreased to 166 in 1903 and decreased further to 94 in 1904; and then increased to 143 in 1905. One accident with numerous casualties inflates the numbers for that year. Moreover, as passenger loads and speeds increased so did the potential casualties. However, expressed in terms of a reasonable standard measure, for example casualties per *x* (1,000 or 1 million) passenger miles traveled, the usual trend—albeit temporarily reversible in the face of a run of bad accidents—has been for rail travel to become safer. Thus, the annual railway report for 1869–1870 called a total of thirty deaths and forty-nine injuries "heavy," yet over 100 died, in 1937, in one

accident alone when the Punjab–Howrah Mail (a fast express) derailed at Bihta. Almost 800 died, in 1981, when a powerful cyclone blew a train into a river in eastern Bihar: a staggering loss of life in what remains India's worst rail disaster.

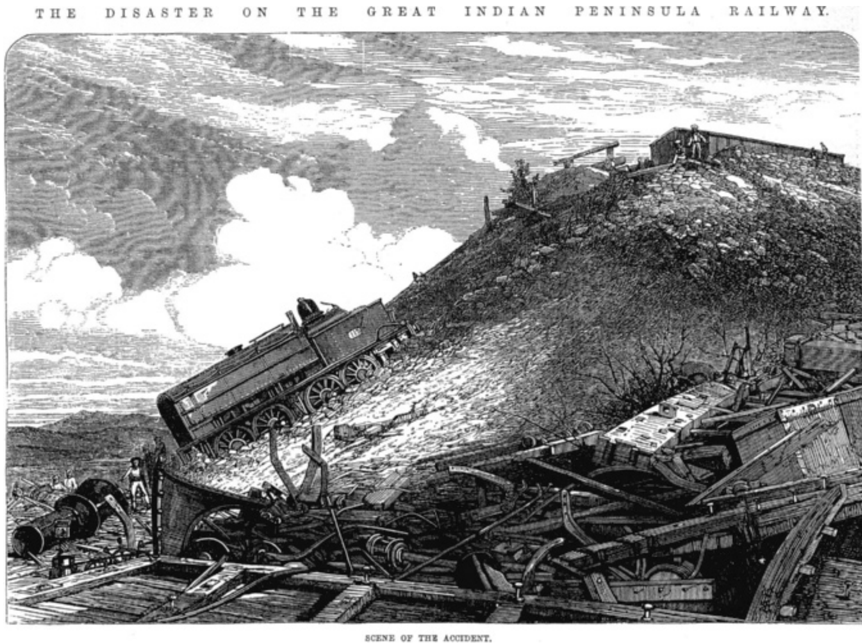
The accident figures reported above cover only those in which passengers were hurt through no fault of their own. Add in other categories—railway employees, trespassers, accidents at level-crossing, suicides, and passengers who contributed to their own death or injury through negligence or misconduct—and the numbers swell: consistently over 1,000 killed and another 1,000 injured in the period covered in Table 5.1. Moreover, accusations were made that Indian railroad authorities deliberately concealed the extent of accident-related deaths, especially among third-class passengers. O. Lloyd published a small pamphlet, in 1911, with the sinister title, *Secret Doings on Indian Railways*. Lloyd claimed rapid expansion of the railroads had led to the hiring of many incompetents, cheap staffing, and overwork.[35] Safety, he said, had been severely comprised, and the railroad authorities downplayed accident figures and engaged in secret, mass burials of victims to reduce claims for compensation. Lloyd claimed the Ghaziabad collision of May 6, 1908, resulted in some 400 deaths rather than the 72 officially reported.

Regardless of the merits of Lloyd's accusations—they are hard to substantiate or refute a century later—accidents had many causes. Weather conditions damaged the permanent way including, especially in 19th-century India, bridge failures. A few such failures were discussed in Chapter 3. The Mulloor Bridge of the Southern Mahratta Railway in the princely state of Mysore collapsed on September 23, 1897, dropping a passenger train into the flooded river.[36] At least twenty people died although the exact figure was hard to establish.[37] Less dramatic weather-related problems led to derailments, subsided embankments, or collapsed culverts. They, too, could have lethal consequences.

Mechanical failure caused other accidents. Braking mechanisms, for example, could fail although, occasionally, their failure had nothing to do with a faulty component. A North Western Railway Frontier Mail derailed shortly after leaving Lahore. It ran the signals at Shahdara Junction when the brakes failed because a rat, seeking warmth on a cold winter's night, had got into the vacuum-operated braking system via a carriage waiting to be attached to the train at Lahore. The vacuum killed the rat during the 10-minute run to Shahdara. The carcass got sucked along the pipe until it lodged at a right-angle bend blocking the airflow, thereby causing loss of braking power.[38]

At the other end of accidents involving animals, a bull-elephant, spooked at night by the noisy, red-glowing locomotive of a goods train, met the engine head-on. This happened in 1869 on the East Indian Railway (EIR) line with fatal consequences for the elephant and the engine driver.[39] Boiler

Figure 5.2
Crashed Train, Bhore Ghat, 1869. *Source: Illustrated London News*, March 6, 1869.



explosions, broken wheels and axles, overheated wheel journals (the well-known “hotbox” of early railroad travel), snapped rails, faulty couplings, and many other mechanical faults could result in accidents.

Brake failure caused the terrible crash on the Bhore Ghat on January 25, 1869, depicted in Figure 5.2. A descending engine smashed through the earth buffer at the end of the reversing line pulling its carriages with it. The carriages tumbled down the embankment and “were smashed to splinters, and mutilated the unfortunate occupants in a horrible manner.”[40] Fifteen among the Indian third-class passengers were killed; thirty-five were wounded.

The other major cause of accidents was human error. Engine drivers failed to obey speed restrictions, drove their locomotives faster than track or other conditions warranted, or disobeyed signals. The incorrect positioning of points caused other accidents. The most spectacular accidents involved head-on collisions when human error by signalmen or stationmasters placed two converging trains on the same track. Figure 1.3 displays two locomotives in a death embrace positioned like two giant, dueling, preying mantises after a head-on near Ludhiana on December 27, 1907. Twenty passengers died and many more were injured.

Traffic on a single line was regulated in the initial decades by stationmasters issuing a written, line clear ticket to a driver, who then turned the ticket over to the stationmaster at the next designated station. No train could proceed on the track in the opposing direction until the ticket was given over, and no train could follow until the original stationmaster received a ticket from a driver proceeding in the opposing direction. This was the single block system. It was simple, almost foolproof, yet inefficient. Ironically, the increasing complexity and efficiency of signaling systems plus increased traffic led to more opportunities for error. A variant error—caused by drivers or signalers—was the rear-end collision when, usually, a following train smashed into a stationary train. In those cases the carriages of the impacted train could telescope into one another: if the impact was severe the loss of life could be considerable.

Finally, deliberate human action caused some accidents. Malicious or mischievous people, or those curious to see what might happen, placed stones or other objects on the rails and caused derailments. Bolts and nuts were loosened, fishplates removed, and even entire sections of rail displaced. These actions deeply concerned the colonial authorities. I have read large printed files dating from 1877 and 1896 (50 to 100 pages) of the GOI in its Home Department (responsible for security among other matters) where incidents of train wrecking were discussed and methods to deter the perpetrators advanced. Since these actions were often blamed on dismissed and disgruntled maintenance gangmen, one proposal was to fingerprint all employed gangmen—tens of thousands of people—to make identification of miscreants easier (the science of fingerprinting was developed in 19th-century colonial India). More reflective officials observed that such a course of action was impossible to implement and that the number of gangmen in regular employment exceeded 120,000, with many more being employed casually. The commander-in-chief (C in C) of the Indian Army had a harsher solution: "the evil of train wrecking" should be confronted by a new law in which the "death penalty could alone meet this class or crime" regardless of whether loss of life had occurred. No doubt that C in C (writing in 1895) would have been more disturbed by train wrecking in the 20th century when the train wreckers sometimes had nationalist motivations.

Railroad Crime

Another danger, crime, probably was a greater concern for the train passenger in colonial India. As one authority states: "From its earliest days, the railways served as an essential catalyst in the growth, both in scope and sophistication, of organized crime in India as well as in the development of modern, professional law enforcement."[41] Much railroad crime was theft of a relatively peaceful sort, although the occasional passenger alone in a compartment was found with a slit throat and missing possessions. One

encountered pickpockets in the stations especially around crowded ticket wickets. Other thieves were opportunistic, dishonest railway employees (who were more likely to focus on pilferage from goods shipments) although they often had more effective, venal methods of augmenting their income through taking bribes. Government comment on the report of a commission of inquiry into a spate of grain robberies on the GIPR in 1877–1878 noted that corruption in the form of exacting money from merchants to expedite shipments was almost commonplace at times of high traffic demand. As for the grain robberies 1,750 people were convicted and punished among whom 306 were railroad employees.[42]

The most interesting and dangerous thieves were those organized into gangs that specialized in railroad crime. These groups were particularly active in the later decades of the 19th century and the early decades of the 20th century. Subsequently, counter-measures reduced their activity. Unlawful access to compartments was made harder by lockable doors, windows with permanent iron bars, and by shutters able to be lowered at night to prevent hands or probes grabbing clothing. External running boards along the outside of noncorridor carriages were eliminated.

Police work was improved, perhaps aided by works such as Rai Bahadur M. Pauparao Naidu, *The History of Railway Thieves with Illustrations & Hints on Detection*.[43] The worthy Rai Bahadur—a title of distinction conferred on him by the governor of Madras in public ceremony in September 1914—had served as a superintendent of the Government Railway Police (railway policemen in 1905 totaled over 13,000). He identified eight classes of "professional railway thieves" of whom the first seven "form distinct communities each with its own peculiar manner and customs" while the eighth, railway pickpockets, were united only by their thieving. He also discussed thieving railway employees as a ninth group. Of the eight distinct communities three, the Bhamptas of the Deccan, the Kepmaries and Ina Koravars of South India, and the Bharwars of Gonda and Lallatpur, Naidu claimed—were "special experts at Railway thefts well-known all over India for several generations."

Naidu, a man with a vested interest in railway crime, might have embellished some of his stories. However, he wrote from personal experience and his accounts convey verisimilitude. One cannot be sure but he does, certainly, provide a fascinating read. One sample must suffice. The Bhamptas, Naidu stated, had been a community of thieves in the pre-railroad era when they were active only during the day when they focused on towns and villages where fairs were being held.[44] But they "soon found out that thefts could easily be committed in trains" and that darkness made their criminal activities easier—so they came to specialize almost entirely in night train robberies. Their numbers increased and they spread throughout India as the railroad network expanded. Railroad development in India created many opportunities which, as we also saw in Chapter 2,

included activities leading to corrupt behavior, unsavory gain, and outright criminality.

The Bhamptas came primarily from certain villages in four districts (e.g., Poona district) in the Western Deccan area of the Bombay Presidency. Financed by wealthy, older "retired" Bhamptas, groups of ten or so men and women would leave their home villages on thieving expeditions. Once they reached their chosen field of activity (which could be far away), they broke down into small groups and the men, disguised or dressed in decent, everyday clothing would buy tickets to some destination. They carried a bag or bundle with them containing turbans and coats to permit changes in appearance, a knife, scissors, a mirror, a six inch chisel, and a tin case of *chunam* paste to apply different caste or sectarian marks to their foreheads. The latter was needed because they often represented themselves to fellow passengers as pilgrims. They noted the passengers that seemed to have bags containing valuables and sat near to them. As darkness fell and the passengers began to fall asleep one Bhampta would lie on the floor covered in a large cloth and pretend to sleep. His companion stretched his legs across to the opposite seat, spread out his cloth, and thus screened his accomplice. The latter, when all was quiet, began feeling the bag under the seat he had identified as a valuable target and, if something felt promising, used his tools—the scissors or the knife—to open the bag or he used the chisel if it was a wooden or metal box. Stolen items were transferred to the accomplice and put into the bag or bundle. The two Bhamptas then got off at the next station or moved to a different compartment. Naidu also described other Bhampta stratagems and their methods of evading detection and arrest. The female Bhamptas, for example, transported smaller but valuable items—jewelry for example—back to their home villages concealed around their waists. The Bhampta women took the additional precaution of traveling in carriages reserved for women only.

Crime, potential or actual, could add a little frisson to the traveling experience of passengers—usually in the upper classes since they were the ones most worth robbing. And, although the heyday of gang robbery has passed, it still exists. I remember a minor railroad official—in whose charge I was placed during a visit to Jamalpur in the early 1980s—putting me on an overnight train from Jamalpur to Calcutta via a less-traveled route. I was instructed to keep myself locked in my compartment all night and to open the door to no one because dacoits (armed robbers) had been at work on the line. Fortunately, I arrived safely at Calcutta. And that is the central point: the occasional accident and crime notwithstanding railroads are one of the safest ways to travel in India and elsewhere.

The continued presence of crime is captured in the *Indian Railways. Year Book 2001–2002* (p. 122): The Railway Protection Force continued its "unrelenting battle against criminals" and "steps like provision of luggage chains underneath the lower birth to secure the luggage by passengers, closing

of vestibules during the night in the trains, etc. have proved effective in checking crimes in trains." Train travelers today see a wondrous variety of heavy chains, formidable locks, and the like offered for sale to secure one's luggage.

I must say, however, that I have never had anything stolen while traveling with Indian Railways (IR) although I was once conned out of a couple of hundred rupees. Leaving Bombay Central for Delhi I was approached in my compartment by a smartly dressed young man with an official looking book. He said he was taking meal orders and each meal cost a certain amount payable in advance. I have always felt secure on India's trains (well, perhaps less secure the night I left Jamalpur) so I forked over the money. When the real IR employee showed up later I knew I had been taken.

Railroad Travel and Its Effects

I know my experiences with train journeys in postcolonial India. And, as already recounted, the physical conditions Indians and other travelers encountered during the colonial period is well documented. But what about the emotional and cognitive effects railroad travel had on Indians as they made their initial forays behind the engines of change? Can we find others who had reactions similar—or perhaps dissimilar— to that of Madhav Rao when he claimed the trains had made "a glorious change . . . in old and long neglected India." And, if so, how did they experience that change? How did Indians experience the unfolding panorama outside their carriage windows as they, immobile travelers, saw, in de Certeau's memorable phrase, "immobile things slip by"?

Did the early Indian train travelers experience an altered perception of time and space? Certainly in the early years of train travel in Europe many writers mentioned sensations of speed, of disorientation, and fear. Europeans also embraced or opposed the seemingly relentless modernity embodied in the new machine and its ensemble of rolling stock, track, stations, and layers of officious employees. How did Indians react at this level to the new mode of transportation? Some tantalizing hints are available to us.

Some Indians embraced the railroads as vehicles of modernity and progress well before any lines were built. In 1844, Babu Ram Gopal Ghosh wrote to Rowland Macdonald Stephenson, the main promoter of the EIR. Ghosh extolled the economic benefits railroads might bring to himself but he also foresaw extensive, positive changes. He wrote about "the civilizing influence of steam" which would change for the better the "political, social, moral and religious condition of the millions." Less than 20 years later another Bengali gentleman, Bholanauth Chunder, rode trains in the course of his travels. His travel account, published in English in two volumes in the late 1860s, contained evocative, positive accounts of his experiences on the trains.[45]

> Friday, the nineteenth of October, 1860, was the day appointed for our departure. Crossing over to Howrah, we engaged a passage for Burdwan. The train started at 10 A.M., and we fairly proceeded on our journey. Surely, our ancient Bhagiruth [the great sage whose austerities persuaded the gods to permit the sacred Ganges to flow to Earth], who brought the Ganges from heaven, is not more entitled to the grateful remembrance of posterity, than is the author of the Railway in India.
>
> Travelling by the Rail very much resembles migrating in one vast colony, or setting out together in a whole moving town or caravan. Nothing under this enormous load is ever tagged to the back of a locomotive, and yet we were no sooner in motion than Calcutta, and the Hooghly, and Howrah, all began to recede away like scenes in a Dissolving View.
>
> The first sight of a steamer no less amused than alarmed the Burmese, who had a tradition that the capital of their empire would be safe, until a vessel should advance up the Irrawady without *oars* and *sails*! Similarly does the Hindoo look upon the Railway as a marvel and a miracle—a novel incarnation for the regeneration of Bharat-versh [roughly India].

Further along, Bholanauth Chunder writes that villagers "still [trains had been in operation for over five years] turn out to see the progress of the train, and gaze in ignorant admiration at the little world borne upon its back." Later the "locomotive quickens its pace by the turn of a peg similarly to the horse of the Indian in Schcherzade's tale; and it goes on and on quite 'like a pawing steed.'" He then waxes eloquently about the "beautiful country," the "rapid succession of villages," "swarming population," and "the numerous monuments of art and industry peculiar to Indian society" he saw as he approached Burdwan. Later, when he gets to Raniganj, the assessment changes for it was of a new town basically created by the railroad "on the confines of a civilized world—beyond commence the inhospitable jungles and the domains of barbarism." However, Raniganj itself was advancing rapidly thanks to the railroad and its progress destined "to rival, if not outstrip, Newcastle" [the comparison here comes from the fact that coal was mined nearby]. At Raniganj he had to change to a rough, horse-drawn carriage—the immediate line beyond Raniganj was still under construction—but he looked forward to the completion of the railroad so large numbers of Bengali gentlefolk could easily enjoy holidays in "lands memorable in history and song" "revelling in scenes and sights of nature—the Railway acting no less than the part of the Messiah."

Throughout, Chunder juxtaposes the new and the old, the railroad and events and sights from India's past; settled, prosperous, "civilized" regions with barbaric, undeveloped jungle areas. The railroad is portrayed as a positive force that will regenerate India and, no doubt, eventually help to free villagers from their ignorance. The scene from the carriage window is an enticing one. But, although grateful and accepting of the new form of

locomotion Bholanauth Chunder places limits on its consequences. There are areas of "Indian-ness" that will remain differentiated. "Morally and intellectually" the Indian could "easily Anglicize himself. Politically, he may, sooner or later be raised to an equality. But socially, in thought, habit, action, feelings, and views of life, he must long measure the distance ... between him and the Englishman."

Other educated, middle-class Bengalis (the *bhadralok*) began to travel widely and in increasing numbers as railroads facilitated spatial mobility.[46] For some, the opportunity to ride the trains became an important reason to undertake a journey. Travel narratives (dating from the 1860s through the first decade of the 20th century), most often written in Bengali by both men and women (though some, like Bholanauth, wrote in English) became a commercially viable genre appearing as books and as articles (often in serial form) in popular, Bengali-language periodicals. What emerges from much of this writing is the authors' reinforced belief in the rootedness of India's nationhood in India's history. To see the historical sites and the habits and customs of other Indians was to understand "the past and the present of the Indian nation" and to regain control of that past by writing travel narratives in Bengali for audiences of fellow Bengalis. *Pather Katha* (1911) written by Fakirchandra Chattopadhyaya "clearly stated that travel was associated with the development and strengthening of a nationalist, historical consciousness." The railroads facilitated the growth of an Indian national identity as Madhav Rao predicted.

There is much of interest in these accounts including the details of what they saw from their carriage windows and experienced within the carriages. Our Bengali travelers experienced or feared humiliation at the hands of Britons. The latter, often less refined or less educated than the *bhadralok,* nonetheless could act as if their race made them superior. The Bengali travelers noted what they shared with other Indians but they also noted what differentiated them: differences of class, caste, and religion; differences that established boundaries to comfortable social interaction but did not preclude traveling together within the trains. Women were mentioned in narratives written by men and women. "The sight of respectable women (respectability being proven by clothes) in railway carriages, streets and other public arenas was usually taken as indication that these women had achieved a degree of 'freedom' by having broken out of the seclusion of their homes."

The examples above come from Bengali train travelers. Bengal had been exposed heavily to British influences longer than any other part of India—Bengal was the bridgehead of the British presence in India; direct British domination dated from the mid 18th century—so the *bhadralok* had been affected by westernization longer than comparable groups in other regions of later 19th-century India. Nonetheless, by the last quarter of the 19th century a group of Hindi writers and publicists emerged from among the upper and intermediate level castes living in the urban and provincial centers of

North India.[47] Trains, their interiors, stations, bridges, and tunnels received prominent mention in the earlier travel accounts written by this group. Stations in particular were described as new settings to be experienced with some excitement and a good deal of trepidation. Har Devi was "awestruck by the size and noise" of the Amritsar station in 1883 when she and her husband undertook a journey by train. The chaos, disorder, noise, and hardships encountered by Hindi-knowing travelers was enough to make the author of a Christian tract, *Yatri Vigyapan* ("Advice to Travellers") published in Hindi in 1876, to liken the hardships of train travel to those endured by those treading the path to Christ. Hindi writers used train travel "to examine a range of social and religious tensions" experienced with greater intensity during rail travel where, for example, caste separation and food taboos were hard to maintain. Ignominious encounters—both at the hands of Europeans and from men of dignity having to sit with those of a lower order—elicited critical comment. Awadh Harischandra wrote (in 1879) in Hindi: "It seems that the railway company is a great enemy of Nature (*svabhav*) because anything that is connected to it, such as eating, drinking and sleeping, going to the loo and so on is a great inconvenience on the train. Perhaps it is for this reason that there is now so much disease in Hindustan."

But, as with the Bengalis, the writers in Hindi expressed a more general appreciation and critique of the railroads—and the wider changes including the transformation of "the very conceptions of territory, economy and culture" to which the railroads contributed in a major way. Regional and/or national space began to be reconceptualized and the door to nationalist aspirations opened. Apprehension and excitement, appreciation and disgust, a sense of novelty and a rediscovery of the old, the clash of modernity and tradition were among the many experiences, emotions, and responses they conveyed. Ambivalence dominated and the railroad was considered a mixed blessing. The humorous and ironical poem (*Relwey Stotra*, published first in 1884) by Radhacharan Goswami summarized many of the negative effects of the railroads—draining the wealth of India, generating a climate of haste, and corrupting traditional social hierarchies—long before Gandhi penned a comparable critique. With powerful imagery Goswami likened the railroads to a demon "towering over the corpse of India." The feet of the railroad, he wrote, "are in both Delhi and Karachi. Your hands are the Avadh Rohilkhand Railway and the Rajputana Railway. Your arse is the Great Indian Peninsula Railway and the rest are all the hairs on your body. You lie down and crush the contents of Bharatvarsh. On the day when you receive your oblation of rupees, you lift it up like a demon cow and devour Hindustan."

Clearly, the railroads had extensive and often quite fundamental effects (physical, emotional, cognitive, and social) on Indians who experienced the railroads directly. Railroad employees, of course, were in closest, continuing contact with the railroads: for them the railroad meant everything from a

paycheck to support the worker and his family, to the acquisition of new skills, time discipline, and a modicum of medical care. But even the new and numerous opportunities for employment that the railroads provided were a mixed blessing. The new form of transportation sometimes displaced older forms of transportation and those they employed. Boat builders and postal runners lost their jobs. The Banjaras—the transporters who had moved goods on the backs of large herds of pack animals—lost much of their business. Ironically, some Banjaras became station porters and today they dominate that position at at least one major Mumbai station.[48]

Some Indians, like the Bengali and Hindi writers just discussed, tell us something about the effects of the railroads and their personal and more general responses to them. These were people who articulated their experiences with those processes to which David Harvey applies the phrase "time–space compression,": "processes that so revolutionize the objective qualities of space and time that we are forced to alter, sometimes in quite radical ways, how we represent the world to ourselves."[49] To which, I would add, to ourselves and *to others*, thus forming wider communities of shared thought and possible action.

Railroads and the Building of the Indian State and Economy

But, beyond the level of "real" people (for lack of a better description) and their preserved accounts of their experiences with the railroads, we need to close this chapter by returning to the broader, albeit abstract, concept of the railroads as large-scale sociotechnical systems that facilitated, linked, and coordinated a wide variety of socioeconomic and political processes and cooperated with and/or assisted other large-scale transportation and communication systems. At this level the railroads made huge contributions to the emergence of a pan-Indian, increasingly integrated economy and polity: what one author has called the emergence of "a bounded national space and economy, ca. 1858–1920."[50] It was, to be sure, a dependent colonial economy and polity—Radhacharan Goswami's line that described the railroads as draining the wealth of India was not without substance—but it was a crucial development for what it was and for what it enabled, namely the "nationalist imaginings of India."[51]

Two concrete examples demonstrate some of the ways in which this long-term, complex mixtures of economy and state building processes worked. Writing in the late 1870s one observer stated:

> The Madras Chetty [Chetty = Chettiar—a Tamil trading caste] hears of something to be bought at Coimbatore, he no longer sends a note, he goes there, views the articles he proposes to buy and buys them *himself*. Nothing suits him so well, no one need to be trusted, not even his own brother, he

> himself has the iron horse at his disposal, and can do the work himself. The litigant at Madura on one side, or Bellary on the other, comes up himself, hears and judges who he will have for his vakeel or his counsel. He comes up for a day and goes home again the next. Besides this the Hindoo or Mahomedan trader is beginning to see that the Railways are opening up the country, and that he will get a sale for many things he cannot sell now. Shortly, it may be said, the Railways are instructing and revolutionising the country. Great changes are effected quietly.[52]

And thus, in thousands and then millions of such transactions, the economy expanded and became more integrated. The invisible hand worked better thanks to the railroads—one might say market opportunities became increasingly visible to more and more people. Indeed, at some point a Chettiar decided to let someone else make the purchase upon his telegraphed instructions but the railroad carried the commodity to its next point of sale—be it within India or to a port for export. And since the railroad could transport large quantities the Chettiars bought and sold larger quantities. Before one knew it, or the participants could identify its presence, a quiet revolution had taken place. One measure of that was the emergence of a national market in food grains. Decades ago, the economic historian John Hurd demonstrated that the railroads were the "determining factor" in bringing about a price convergence (previously grain markets had limited geographical spread and prices could vary greatly from locality to locality) throughout India for wheat and rice. "The behavior of prices indicates that because of the falling costs of transport, markets were not only widening but were becoming national markets."[53]

One other example of the complexities of the transportation and communication revolution, its quiet but potent effects on the economy and beyond, and the synergies that became available had been illustrated by a service introduced by the post office in 1877 and refined over the next decade.[54] This was *Value Payable Post* (known in Britain and North America as Cash on Delivery, i.e., C.O.D.) where the post office, for a small commission, collected the value of a shipment from its recipient and transmitted the payment to the sender, usually a commercial individual or firm. By the mid-1880s large parcels could be sent by train with the invoice going by postal mail and the value of the trainshipment collected by the post office on delivery of the invoice as Value Payable Post. "The facility of receiving the published matter at the door-steps under the value payable system encouraged the people to purchase the published matter and newspapers."[55] None of this required any new technology but it did require institutional innovation within the post office (with European practice as a model) and cooperation between two institutionally separate components of the transportation mega-structure: the railways and the postal service. The results of this small innovation were enhanced commerce and the increased circulation

of information and ideas via the products of print capitalism. The 419 publishing houses in business between 1880 and 1905 in Punjab alone (printing newspapers, magazines, books, and other materials in Urdu, English, Panjabi, Hindi, Persian, Arabic, and Sindi with Urdu predominating) provided one example of this development.[56] Railroads facilitated print capitalism. Our Bengali and Hindi writers wrote about railroads; the railroads carried their books and articles to more distant readers.

Swift and sure mail deliveries were, in turn, dependent on improvements in road and rail transport. Symbolic of the recursive relationship was the fact that the crack express trains were often mail trains. Moreover, by 1864 specially designed mail sorting vans were in use in which the mail was sorted while in transit by rail. A similarly development occurred in 1883 when post offices began to be utilized as combined postal and telegraph offices thus making telegraph facilities available in many smaller places where free-standing telegraph offices were not economically viable.[57] Vikram Seth's Mrs. Rupa Mehra's traveling arrangements depended on the trains and the other methods of communication.

The railroads were at the infrastructural center of a great many interrelated changes. Many of those changes were deeply felt by those who lived through them. Sometimes the engines of change were highly visible, indeed palpable; at other times they were almost invisible but no less potent. All were consequential for the making of modern India. The engines of change gathered momentum in the first decade of the 20th century although, as argued by one writer in 1911, the full capacity of the railroads to change India needed to be unleashed.[58]

> The railways, free from financial shackles, can extend and and multiply to the profit of all. There is not a branch of Government they cannot help, not an industry they cannot benefit, not an individual within their reach to whose wants they cannot minister. They are alike sources of revenue and payers of taxes, and they can also assist in the exchange of labour. To regard them merely as carriers is to sterilise effort and to deny the experience of all countries.

CHAPTER 6

"Nationalizing" the Railroads, 1905–1947

Introduction

India and Pakistan emerged as sovereign nation-states on August 15, 1947. 1905 to 1947 were difficult, turbulent, confrontational years in colonial India—indeed in the entire world whose violent, overshadowing events, World Wars I and II, had significant repercussions for the peoples of India. The railroads were not immune to the wider world and its pressures: pressures the railroads had helped to intensify by linking the Indian economy more closely to the global economy. World War I saw the railroads worked hard and with insufficient capital spending to compensate for the additional demands. The postwar recovery resulted in a brief window of opportunity and prosperity for the railroads in the mid and later 1920s, but then the Great Depression struck and severe economic difficulties reappeared. Starting in 1939, the railroads again had to deal with intensified working in a financially tight, wartime environment. In short, much of the period 1905 to 1947 was a time of difficulty or even crisis for the railroads.

The railroads experienced many changes. These included some major technological breakthroughs such as beginning of electrification in February 1925. Other changes were more gradual; for example, the continued expansion of route mileage: 26,955 in 1905; 40,524 in 1947, a substantial 50 percent increase. Important but less visible changes included adjustments to the railroad policies of the GOI and, related to that, alterations to the institutional structures and practices of the railroads. But, all of these changes notwithstanding, railroad history, like much of the history of India in the final decades of colonial rule, was dominated by the movements for national

freedom and the consequences of world events: the latter often interacting with the former as mediated through the colonial connection.

Nationalisms

Nationalism had stirred among South Asians in the last half of the 19th century—facilitated by the railroads as discussed in Chapter 5—but colonial considerations had the upper hand. The balance changed during the 20th century. British colonial authority remained a force to be reckoned with but, slowly and with more than one setback, the nationalists and their agendas moved the history of India along new lines. If the railroads began to use electric engines then a new motive power, nationalism, emerged to lead India into a new, independent future. If India before World War I was "ultimately a despotic foreign regime dependent upon military power" then by 1918 the initiative had moved to Indians who could "more effectively accord the support that Britain required on terms of their own."[1]

Indian nationalists struggled to "nationalize" India's railroads. They used the railroads to further the cause of the struggle for independence—a central example of the complex relationship between the mechanisms of colonial control and the efforts to end colonial rule in South Asia. Indians sought to appropriate the railroads; they sought to make them more Indian and more responsive to Indian problems, wants, and aspirations. This was a long-term struggle that focused on a variety of issues.

Gandhi, Nationalism, and the Railroads

We can use the iconic figure of Mahatma Gandhi (Mahatma translates roughly as "Great Soul") to explore some of these issues and appropriations.[2] Mohandas Karamchand Gandhi (1869–1948) stands at the juncture of the three forces instrumental in the forging of modern South Asia: imperialism in the form of British colonial control of South Asia; nationalism(s) and the struggle of South Asians to free themselves from British domination; and a transportation revolution spearheaded by the railroads. The latter, as we have seen, facilitated British control of India and Indians and also facilitated the growth of South Asian nationalisms.

The railways also increased traffic (in commodities including the products of print capitalism) and the mobility of people across India that, ironically, facilitated the growth of nationalism(s) as an ideology and as an organized movement dedicated to ending British rule. Gandhi and other nationalist leaders used the trains to travel throughout the subcontinent as did the lesser lights of the national movement: the organizers, fixers, troubleshooters, committee members, bagmen, and the thousands of delegates who attended the

annual meetings of the Indian National Congress (founded in 1885 it was the political organization that directed the Indian freedom struggle), held at a different location each year. In 1921 Gandhi encouraged those active in the national struggle—"public workers" he called them—to travel third class since first and second class would soon exhaust the movement's funds "and our ship of swaraj will make no progress."[3] Madhav Rao's prophecy in 1885 had largely come true: "if India is to become a homogeneous nation, and is ever to achieve solidarity, it must be by means of the Railways as a means of transport, and by means of the English language as a medium of communication."[4]

Gandhi guided the Indian national movement from roughly 1919 until his assassination in 1948. A railroad-related event spurred him to take a more politically active stance in racially divided South Africa in the 1890s. Gandhi's expulsion on racial grounds from a first-class carriage in 1893 in Natal and his subsequent cold night at the rural Maritzburg station convinced him to confront injustice more directly. He embarked on the course that led him to oppose racial injustice in South Africa and later to return to India (1915) and to join the struggle for Indian independence. His leadership role in the latter led Jawaharlal Nehru (1889–1964), the first prime minister (1947–1964) of independent India, to refer to Gandhi as the "father of the nation." He was known worldwide as an apostle, tactician, and practitioner of nonviolent resistance. Subsequent historical actors of considerable stature, such as Martin Luther King, drew upon Gandhi's ideas and practices.

By the time, 1919, that Gandhi became a leader of the Indian National Congress the railroads already had a tentacular presence in South Asia. Route miles exceeded 35,000. The railways employed over 69,000 people, and transported over 480 million passengers and nearly 84 million net tons of goods in the financial year 1919–1920. The benefits of the railroads to the Anglo-Indian connection and to the security of British colonial rule in the Indian subcontinent remained immense. They remained, most decidedly, colonial railways. There can be no effective argument against Gandhi's statement first enunciated in 1909, and repeated often in various forms thereafter, that "it must be manifest to you, that, but for the railways, the English could not have such a hold on India as they have."[5] But, the hold was weakening and the railroads changing!

At the macroeconomic level the colonial emphasis on rail routes that linked the colonial port-cities (and centers of colonial administration, e.g., Bombay, Madras, and Calcutta) with raw material producing, interior hinterlands, reinforced by freight rates that favored port–hinterland–port routes over inland to inland destinations, served an Anglo-Indian connection decidedly favorable to Britain. This connection saw Britain run trading surpluses with India as Indians bought value-added British manufactured goods and India sold less valuable raw materials (e.g., cotton and jute) to Britain. India,

in turn, ran surpluses with other parts of the world to which it supplied raw materials. The overall effect was that the British surplus in its trade with India kept the overall British balance of trade positive, since the surplus with India more than offset Britain's trade deficit with the rest of the world. Without the railroads, bulk transport of commodities to and from the ports would have been difficult, slow, more costly, and more uncertain. Even with railroads, India's monsoonal climate can make travel in the rainy season and its sometimes-flooded aftermath a challenge.

The wide-ranging economic benefits included the special protection colonial rule afforded to British manufacturers of steam locomotives as they maneuvered, successfully, to maintain a near-monopoly on the supply to India. During the colonial period 91 percent of India's broad gauge (5 feet 6 inches) and 77 percent of the meter gauge steam locomotives came from Britain.[6] Figure 6.1 shows a steam locomotive being loaded at Newcastle for shipment to India. Although nationalist pressure in the 20th century did not manage to alter significantly the policies regarding the purchase of locomotives there was a move—further encouraged by the difficulties of getting railroad supplies to India during World War I and strengthened during World War II—to buy made-in-India products, notably the steel rails upon which the engines of change moved.

The completely Indian-owned Tata Iron and Steel Works (TISCO) opened at Jamshedpur in eastern India's coal and iron belt in 1911. Soon after, it received a modest order from the GOI for 20,000 tons of steel rails annually at a price equal to that of the imported item. However, when British supplies of iron and steel stopped in 1915 Tata filled the breach and thereafter became the major supplier of steel rails, chairs, and fishplates to the railroads. By 1928–1929 the railroad requirements for these and many other steel and iron products were met from within India. Thus, slowly, partially, and belatedly, the expectations Karl Marx asserted in 1853 came to pass. "You cannot", Marx wrote, "maintain a net of railways over an immense country without introducing all those industrial processes necessary to meet the immediate and current wants of railway locomotion , and out of which there must grow the application of machinery to those branches of industry not immediately connected with railways. The railway system will therefore become, in India, truly the forerunner of modern industry."[7] Marx had not foreseen the power of the colonial connection to retard the creation of what economists call "backward linkages" but events and movements inside and outside India in the period 1905–1947 "nationalized" more than India's railroads.

One can take all of the multiple economic and political consequences of colonial railway development in 19th-century India one step further and argue that the railways were central to the creation of modern India as a territorially integrated polity—a sovereign state (after 1947) in the process of becoming. To repeat: "Some historians have even gone so far as to declare, in effect, 'No Railways, no modern India.'"[8] Railroad-enhanced traffic and

Figure 6.1
Steam Locomotives being loaded at Newcastle, England, for shipment to India, 1920s. *Source: Engineering*, December 28, 1923.

THE SHIPMENT OF LOCOMOTIVES TO INDIA.

SIR W. G. ARMSTRONG, WHITWORTH AND CO., LIMITED, ENGINEERS, NEWCASTLE-ON-TYNE.

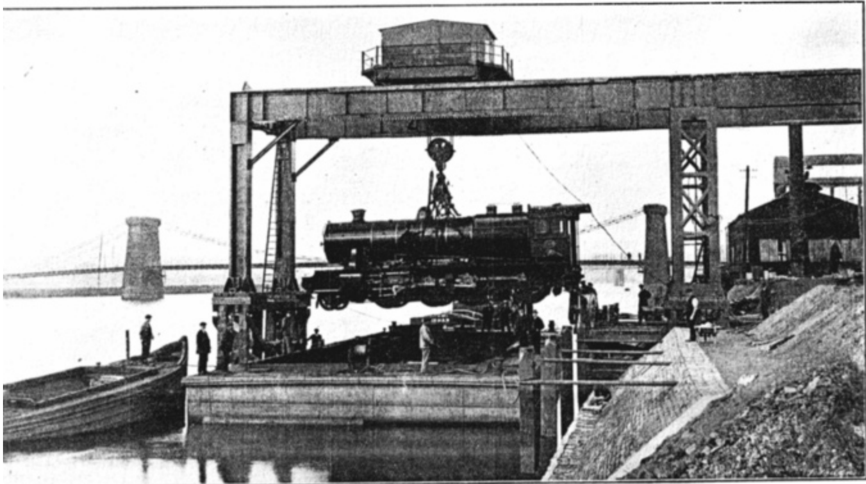


FIG. 3. LOADING A LOCOMOTIVE INTO BARGE AT SCOTSWOOD WORKS.



mobility designed to further British imperial interests also had the effect of creating a new state and facilitating a related set of processes that bolstered the activities of Indian nationalists who wanted to set their nation-state free. It is an argument that deserves close consideration.[9]

The Railroads, Their Critics, and the Politics of Nationalism and Communalism

Indians, as we saw in previous chapters, contested some aspects of the railroad presence in India from the start—indeed, well before Indian nationalism in an organized and institutionalized form can be said to have been present. Gandhi's recognition of the roles railroads played in securing India for Britain was a powerful one, and served as a useful corrective to those who had more favorable views. However, always present in Gandhi's critique was his deeper concern about the role railroads—and other complicated machines and their institutionalized relationships to fast-paced, modern civilization—played in altering a simpler, slower, less-complicated way of life he advocated. When he wrote in 1927 that the railways were a "burden to the village people," "simply sucking the village and leaves it absolutely dry", he was not only making a criticism of British rule and the railroads of the Raj (that contained echoes of earlier criticisms by 19th-century writers—see Chapter 5) but he was also bemoaning injury to a village-based way of life he cherished.[10] Machines, for Gandhi, most emphatically were not the measure of humankind.

One issue, raised very early on (see Chapter 5), was the deplorable conditions of rail travel, especially for third-class passengers: the class in which the overwhelming majority traveled and which generated the most passenger-derived income for the railroads. This issue did not disappear in the period 1905–1947.

Indeed, Gandhi consistently criticized the ways in which the railroad administrations treated their third-class customers. Some of these criticisms were remarkably similar to those of 1866 and 1870, discussed in Chapter 5. Soon after his return to India in 1915, Gandhi embarked on a series of extensive train journeys to familiarize himself with India and its problems, including the conditions of third-class train travel. In a "Letter to the Press on Third Class Travelling on Indian Railways" dated September 25, 1917, he vividly detailed what he had seen: thirty-five passengers packed like sardines into a carriage where, during the night, "some lay on the floor in the midst of dirt and some had to keep standing"; a "pestilentially dirty" WC; compartments never cleaned such that passengers "waded through dirt"; the need to give bribes before tickets could be procured; and so on.[11] Tongue-in-cheek Gandhi suggested that if the Viceroy, the Army Commander-in-Chief, and other dignitaries made surprise train journeys by third class, then Indians "would soon see a remarkable change" in the conditions of third-class travel.

However, to a different forum—a speech to the Gujerat Political Association in November 1917—he also said that the hardships of railway travel would remain unredressed if Indians continued to accept them uncomplainingly. Although suffering had merit, it also had its limits. "Submission out of weakness is unmanliness. That we tamely put up with the hardships of railway travelling is a sign of our unmanliness."[12] The campaign to improve railway travel was, to Gandhi, an aspect of an increased political assertiveness he wished to stimulate among Indians.

As late as 1946 he wrote: "First and second-class passengers are pampered, luxurious habits encouraged. Third-class passengers on whom the railway revenue largely depend are denied even elementary amenities and exposed to all kinds of hardship."[13] At least his 1946 condemnation was not as vivid as the piece he wrote in 1929 titled "Third-Class Travelling" that included "the latrines in the Jodhpur State Railway, are, in my opinion, absolutely intolerable, insanitary and unfit for human use. They are little black holes, without ventilation, without light, without latches to close the door from inside."[14]

An issue that became increasingly important to the nationalists in the 20th century was the Indianization of the upper levels of the railroad workforce. The connection between the railroads and the security of British rule had led to a persistent policy whereby middle and upper management in the railway services were staffed by men from Britain with Eurasians (Anglo-Indians) over-represented in the supervisory ranks and among the drivers and guards. B. G. Gokhale, a leading figure among early Indian nationalists (and the man to whom Gandhi turned for advice and assistance in 1915 when he, Gandhi, returned permanently to India from South Africa) debated railroad issues in the Legislative Council of India in March 1911. Indians, he said, were almost completely excluded from the higher positions on the railways.[15] "If people elsewhere, if the Japanese for instance, if other people are managing their Railways, I do not see why we should not be able to do so. After all, we are not born with a double dose of original sin. I do not say that we want to dispense with European guidance, but there is undoubtedly room for a much larger employment in the higher ranks of Railway service without impairing efficiency in the least."[16]

Authorities recognized the higher costs European recruitment incurred. But, wrote one high official in 1915, although Indian railways were a business and had to be operated economically they were also necessary to maintain "the security of the country both from a military point of view and from the point of internal security, and that had to be taken into account in dealing with the recruitment of staff."[17] The result of this policy was a railway workforce described in 1921 as a body that totaled some 710,000 workers of whom about 7,000, 1 percent, were British. "But the 7000 were like a thin film of oil on the top of a glass of water, resting upon but hardly mixing with the 700,000 below. None of the highest posts are occupied

by Indians; very few even of the higher."[18] As late as 1939 Britons occupied one-half of all railway positions designated as superior although that number moved downward considerably during World War II. Nationalist pressure had some effect but not as much as Indians wanted.

By the 1920s the general demand to Indianize the railway workforce was joined by the clamor of many communities to have guaranteed employment quotas within that workforce roughly comparable (or in the case of the Anglo-Indians greater) to their percentage presence in India's general population.[19] The communities in question were largely religiously based and, although those communities were not created by the British, their separate identities were enhanced by the practices and policies of colonial authorities seeking to ensure minority rights and/or to divide and rule. A major step in this direction occurred in British-sponsored constitutional reforms in 1909 when Moslems were formed into a separate electorate for the purpose of electing (on a very limited franchise) members of the enlarged legislative assemblies.

The "communal problem" as it was, and is, known in the South Asian context and the attempts to "communalize" the railroad workforce indicate how the nationalist struggle(s) was waged on many fronts, went through different phases, and developed accumulatively over many decades into increasingly effective but also increasingly differentiated strands. Different issues and tactics dominated at different times. Communal issues—strong community identities and loyalties based primarily on the common identity and shared group interests presumed to be present within many of India's religious groupings (e.g., Hindu, Moslem, and Sikh)—thus became an important part of the political dynamic in South Asia and, in the event, contributed to the emergence of two countries, India and Pakistan, in 1947.

Nationalism in India was never a monolithic process and its communal aspects (which, like nationalism, deals with the politics of identity) deeply troubled Gandhi. Indeed, in 1932 one of his most severe fasts resulted in a modification to the Communal Award worked out between the British and leaders of various South Asian communities (including untouchables). A supplement to that award in 1933 said that 25 percent of railway positions should be reserved for Moslems and 8.75 percent for other minority communities.[20] The crucial point for the history of the railroads is that they became more and more enmeshed in the multifaceted political struggles waged in India between 1905 and 1947. One measure of that imbedding can be found in the debates of the enlarged Indian Legislative Council set up after the Government of India Act of 1919 took India further down the constitutional road to enhanced self-government.[21] The 1919 Act had in its preamble the statement that Indians were to be associated increasingly in the administration of India in order to foster "the gradual development of self-governing institutions, with a view to the progressive realisation of responsible government in British India as an integral part of the empire."[22]

The 1919 Act was too little too late as far as many Indian nationalists were concerned but the Legislative Assembly, within its British imposed limitations, did become a forum for vigorous debate and questioning. Questions related to the railroads, especially employment-related questions, became the most frequently asked. The 893 page *Extracts from the Debates in the Indian Legislature on Railway Matters*, Delhi Session—January–March 1926 was followed by four, similarly sized volumes covering the sessions through 1928. In sum, 3,200 printed pages, small-type, were needed to cover the questions and answers related to the railroads, during 1926–1928 alone. The railroads, the largest employer of modern sector labor in India and a force in the everyday life of many Indians, clearly had moved to the center of political life.

Few railroad matters were too small or too large, specifically individual or grandly collective, to fail to attract the attention of the Indian members of the Council. For example, in September 1924 Khwaja Abdul Karim asked the Railway Board representative if government knew that Muhammad Serajuddin, a machineman at an Eastern Bengal Railway workshop, had been dismissed simply for saying his midday prayer at work. The Board representative replied that Serajuddin had been fired for idling and absence from work and not for the reason stated in the question.[23] At the other end of the scale, when Agarwal asked in September of 1922 what steps government had taken or would take to satisfy the grievances and demands of Indian railroad employees the railroad spokesman replied that it was impossible to answer such a general question.[24]

Many activists felt that the improvements they wanted could not be attained fully until all railroads in South Asia became state-owned and state-operated. Nationalization, as it is often termed, had made a tentative beginning back in 1869 with the inception of the meter gauge state railways, grown with the growth of that system, made a step into broad gauge operations with the state purchase of the East Indian Railway (EIR) in 1879, and half a step backward when the GOI immediately made the former owner-operator, the private EIR Company, the operator of the line. The results of decades of inconstant policies was an Indian railroad system in April 1905 with a small 5,570 miles owned *and* operated by the state railroad system (13,231 miles were state-owned but privately operated) out of the total mileage of 26,955 miles. By 1945, however, the situation had changed completely: almost all the railroads in India were state-owned and state-operated.

A crucial turning point occurred in 1921. An important committee (the Acworth Committee) appointed by the Secretary of State for India to enquire into the administration and working of Indian Railways recommended first, and unanimously, that all Indian railroads should be managed in India. In short, the committee recommended the termination, when opportune, of the contracts with the private companies headquartered in England. In a

divided vote, the majority of the committee additionally recommended that most railroads in India should be state-managed. A minority recommended that private companies located in India could still have a role in delivering rail services to Indians.

The advocates of state-managed railroads proved the most influential because, in considerable measure, informed Indian opinion—active nationalists if you will—favored such a move and pressured the GOI to move in that direction. As the committee stated: "an awakened national self-consciousness" had led many Indians to expect greater Indian control of the railroads hence the committee members, though initially predisposed "in favour of private enterprise" did not hesitate "to recommend in India the state should manage directly the railways which it already owns." Thus, in the decades after the Acworth Committee the contracts with the private companies were not renewed at their expiry dates and their networks were brought into the state railway system: the massive Great Indian Peninsular Railway (GIPR) and EIR systems in 1925 (both of which were state-owned but company-operated); the Bombay Baroda and Central India Railway (BB&CI) and the Assam–Bengal Railway in 1942; additional lines in 1943; and almost complete nationalization by October 1, 1944, when the Bengal–Nagpur Railway was taken over.

However, in many other dimensions the railroads in the earlier 20th century continued to be central to the secure maintenance of British rule in India. The railroads, to the end, facilitated British rule *and* nationalisms; they continued to facilitate colonial administration and its forceful underpinnings.[25] The latter, British soldiers (and loyal Indian soldiers and police forces), were stationed in cantonments and garrisons across the subcontinent from which trains could transport them quickly to trouble spots. A mid-level, British rail official working in India in the 1920s wrote, "by providing a speedy means of movement of troops and supplies the Railways have aided the government to maintain the peace."[26] Striking evidence of the British recognition of the role the railroads played in maintaining their hold on India comes from the autobiography of a senior British official, Sir Michael O'Dwyer (lieutenant-governor of the Punjab Province). In 1919, the year in which Gandhi took center stage within the Indian national struggle, the Punjab was rocked by a series of anti-British actions. O'Dwyer referred to those events as "The Punjab Rebellion of 1919." He believed "the persistent attempts on the railway and telegraph lines through the whole length of the Punjab from Delhi to Attock, showed more than anything else a prearranged design to immobilize our troops and isolate the main centers of rebellion."[27]

The concern of Gandhi and others for the conditions of travel and the actions of the few that destroyed trains highlights the ambivalences and divisions with which Indian nationalists—and their communal offspring—approached railroad-related issues. Gandhi condemned railroads as evil but used them actively to travel throughout India on behalf of the Indian struggle

for national independence. The greater good made railroads a necessary rather than an unmitigated evil. Indeed, in 1946, Gandhi wrote: "I still abide by whatever I wrote about railways, etc., in *Hind Swaraj* [the first version had appeared almost 40 years earlier]. But that applies to an ideal state. It is possible that we may never reach that state. Let us not worry about it. It is for this reason that I have said that if we do not have railways and other such facilities, we should not feel unhappy. We should never make it our duty to multiply such facilities. At the same time we should also not make a duty of giving up these things."[28]

The majority of South Asians embraced railroads as a progressive innovation. Many sought to use railroads for the nationalist cause and to further national goals. The demands for improved travel conditions and for the Indianization of the upper levels of the railroad workforce tapped important veins of discontent and fitted well with the ways in which national leaders felt a truly *Indian* railway system should operate. Except for Gandhi and some of his close adherents the leaders of the national struggles favored railroads although they questioned aspects of the ways in which they operated. However, the negative aspects from the Indian perspective were outweighed by one overwhelming achievement: the railroads helped to bring the Indian nation into being.[29] As an Indian historian of the freedom struggle, Tara Chand, put it: "The development of the railways which made this communication and intercourse between the people of different parts of the country possible may, therefore, be said to mark an important stage in the evolution and development of national consciousness."[30]

Others—the minority—saw the railroads as a physical manifestation of a hated British presence. They may well have recognized, as O'Dwyer did, that the railroads were the crucial transportation corridors of colonial power. The sabotage of lines did take place from time to time (although the perpetrators were not necessarily nationalists; sometimes they were disgruntled, dismissed employees). Bombings occurred. But, on the whole, violent attacks on the railroads were few in number despite their vulnerability. The worst and most prolonged sabotage occurred in late summer through the fall of 1942 when, during the Quit India Movement, telegraph lines were cut, bridges dynamited, lines ripped up, and signal boxes bombed. With the Japanese on the doorstep of India, the British responded forcefully to the nationalist campaign. Many Indians were imprisoned or killed before the agitation was quelled. Nonetheless, it was, perhaps, the role railroads had come to play in the everyday life of South Asians that kept most nationalists away from physical attacks; that, and the general commitment to nonviolent resistance that was the hallmark of Gandhi's influence over the Indian freedom struggle.

Others embraced ticketless travel as a satisfying act of self-interest sometimes justified as nationalist, anti-British protest, and, immediately after independence, as a national right (since the people "owned" the trains). The

existence of ticketless travel as a significant problem became known to the railway authorities by 1923 and has continued to bedevil the state-owned and operated IR in the postcolonial period.[31] If any historian needs to be reminded of the messy, complex, even conflicting motivations present in most human activities, ticketless travel in India provides the reminder. Gandhi, ever the man of morality, denounced ticketless travel in late October 1947. He said there used to be some ticketless travel—which he had opposed—but now "all over the country people have started to travel without tickets." This behavior, Gandhi said, was "a kind of violence. In my view it is plain robbery. At this rate India will be reduced to utter poverty and we shall be left without railways or anything else."[32]

World Events: World War I

Nationalists and their remaking of the political landscape increasingly influenced the course of India's railroad history. However, the nationalists, the railroads, indeed most things and peoples South Asian, were, in turn, significantly impacted, directly or indirectly, by world events. Thanks to the colonial connection—tightened by the railroads—India was tied closely to Britain and to the global economy; Britain's international commitments entangled India. India was the centerpiece and bastion of a British imperial presence that extended from East Africa to East Asia. Three events in particular affected India and her railroads: World War I (1914–1918), the Great Depression of the 1930s, and World War II (1939–1945).

Voluntarily and involuntarily Indians participated extensively in World War I. As an imperial dependency, India was automatically committed to the war effort of the British Empire. India's resources and productive capacities were placed at the service of the British war effort. Indians in their tens of thousands became soldiers and fought for the British in the Middle East, in Europe, and elsewhere. One moving testimonial captures the extent and nature of their involvement and sacrifice. Go to Ypres in Belgium—in Flanders in whose fields the poppies grew, row on row—and look at the names of the dead inscribed in great numbers on the massive stone walls of the grim monument to those who fell in the extended battles in and around that town. Name after name is Indian—usually someone from the Punjab; not an unknown Indian but a barely known Indian who died far away from home fighting for the British Empire.

The railroads were crucial to India's participation in the war. The system, already strained by increased traffic demands in the immediate prewar years, was worked hard to meet the additional demands for military transport. The British requisitioned locomotives, rolling stock, and permanent-way material for use in the Middle East and elsewhere. This placed additional strain on the railroads whose capital budgets, moreover, were reduced and whose

sources of supply were interrupted by the war—although, as we have seen, that interruption did create some opportunities for some Indian manufacturers. By December of 1916 the railroads could no longer handle all the traffic requiring railed transportation so passenger traffic was curtailed, fares increased, pilgrim traffic prohibited, and a Central Priority Committee set up to control goods traffic. Thus, in the reporting year 1917–1918 goods tonnage and passenger numbers declined.[33] Net tons of goods carried in 1916–1917 was 83,107,000 and in 1917–1918 it was 82,427,000; passengers carried in 1916–1917 totaled 457,001,000 and reduced to 403,309,000 in 1917–1918—substantial numbers in both reporting years but necessarily reduced in 1917–1918 when it became clear the system was overloaded.

Recovery and Prosperity

Most of the 1920s were good years for the railroads and their employees. Route miles and numbers of permanent employees, two measures of success, increased considerably: 35,129 miles in 1919–1920 and 39,678 in 1929–1930 for an increase of 4,549 miles; 692,544 employees in 1919–1920 and 789,903 in 1929–1930 for an increase of 97,359. The employment total in 1929–1930 was not surpassed until 1942–1943. However, the most telling statistic was the Rs. 2,772,183,000 cumulative capital expenditure on the railroads in the decade 1919–1920 to 1929–1930 as compared to the preceding and succeeding decades, Rs. 1,239,101,000 and Rs. 306,025,000 respectively. Thus, substantially larger budgets enabled the railroads to replace their much worn equipment, extend their route miles, and employ more people. The railroads also benefited from the generally robust performance of India's economy. More goods and more people were transported: compare the data given above for the final years of the war with those for 1929–1930 when net tons of goods carried totaled 113,692,000 and passengers numbered 629,952,000.

Increased budgets for the railroads made everything else possible. The Acworth Committee's *Report* and recommendations (1921) had much to do with the GOI's increased spending on railroads—recommendations the committee carefully placed within a context informed by "public opinion in India." The committee wrote that the evidence was "overwhelmingly strong as to the urgent need of drastic measures of reform and reconstruction of the entire railway machine" (*Report*, p. 7). Substantial increases to the capital budgets of the railroads were recommended along with other fiscal measures—including the separation of railroad finances from those of the general budget of the GOI so that the railroad administration, not the Finance Department of the GOI, would manage the railroad budget. As we have seen, railroad budgets were increased and their separation from the general finances of the GOI occurred in September 1924.

The Acworth Committee was not the first nor the last committee of enquiry to have important effects on the railroads. Parliamentary or government committees reported on this or that aspect of the railroads in every decade from the 1850s through the 1990s; some decades had more than one investigation. The Acworth Committee, however, likely was the most influential: it contributed significantly to the nationalization of India's railroads and to their improvement in the 1920s.

Among the specific improvements the beginnings of electrification stand out. Discussed as early as 1914 but made impossible by the war, limited electrification was approved in 1922. The first electric line, the 9.5-mile Bombay Harbour Branch section of the GIPR, opened in February 1925. Electrification of the suburban lines of the GIPR in Greater Bombay was completed in 1929, when electrification reached Kalyan, 33 miles from Victoria Terminus (VT). In 1928, and further extended in 1936, Bombay suburban track of the BB&CI was changed to electric service. A Madras suburban line was changed to electric working in 1930.

The Engines of Change and the Growth and Suburbanization of Bombay

The engines of change, made more effective by electric working in the case of Bombay and Madras (electrification was contemplated for Calcutta but not implemented until the postcolonial period), contributed to the suburbanization of India's cities. This was particularly evident in Bombay whose insular-peninsular location (modern Bombay exists on what was once a series of seven islands) required a rapid mass transit system to develop into a great megalopolis.

A formal census of Bombay in 1872 returned a total population of 644,405 and that of 1881 a population of 773,196. The 1941 enumeration returned 1,489, 883 inhabitants. In the early 21st century Bombay at 15 million plus ranks among the world's five largest cities and India's largest.

The railroads enabled Bombay's growth. Concomitantly, and most assuredly relatedly, another development early in the railroad age gave the city a new growth engine in the form of another application of steam technology: the cotton textile industry. The first mill started in 1854 and within 20 years fifteen mills employing a daily average of 11,000 workers and consuming 82,000 bales of cotton were in operation. By 1901 the number of cotton mills had risen to seventy-six and the daily employment exceeded 82,000. Raw cotton for the Bombay textile industries and for export overseas became a major cargo for the railroads serving Bombay just as manufactured textiles from the industries of Bombay and overseas filled the goods' wagons heading out of Bombay for destinations throughout India.[34] Cotton and cotton textiles, however, were only some of the bulk items carried to and from Bombay via the railroads: other items were

used or produced locally and/or imported or exported through the port of Bombay.

The increased volume of shipping traffic made possible by the railroad required the expansion of Bombay's harbor facilities. The development of a transport infrastructure to serve the port culminated in the opening of the Port Railroad in 1914–1915. The Port and Port Railroad, in turn, depended on the general development of the two major railroad systems, the GIPR and BB&CI, that provided the links to Bombay's hinterland. As one scholar puts it: "the track of the GIP cut a swathe through some of Bombay's settled areas, while the main stations, sidings, workshops and head offices of both companies required considerable space."[35] Port development required railroad development: the two developments shaped and reshaped the cityscape.

However, a concentration on goods traffic ignores what became the single, most important item conveyed on most of India's railroads, the human passenger. By 1900 the annual total of inward and outward passengers through the railroad stations of Bombay reached nearly 19 million people.[36] Many were laboring men who flocked by rail to the employment opportunities in the Port and the cotton textile mills from Bombay's rail-extended hinterland. However, as the city expanded an increasing number of the passengers that daily crowded the train stations were commuters.

Bombay's narrow site, active reclamation from the sea notwithstanding, began to burst at its seams. As early as 1881 some neighborhoods had population densities in the 500–700 persons per acre range.[37] Bombay's population grew steadily. Space had to be found for the city's growing economic base—the port, the railroad infrastructure, the cotton mills, government offices, financial establishments, and a good deal more—and to house all the people employed therein and/or attracted by the prospect of employment.

A complex synergy operated to spur the city's population growth and spatial expansion. The railroads helped to fuel growth but the railroads also needed some of the limited supply of urban space. However, the same railroads also provided the opportunity for a daily commute to and from places of work. The railroads, therefore, facilitated the movement of people northwards to residences in parts of the Bombay Island beyond the commercial-industrial-administrative port areas of the southern and narrower half of the city.

The continued growth of Bombay subsequently led to the suburbanization of Salsette Island and then the adjacent mainland. Idyllic countryside like that depicted in Figure 1.2 disappeared. The railroads made suburbanization possible since they alone had the capacity in a lineal, narrow city to transport daily large numbers of people to and from work. Huge numbers of people continued to live in or near the main areas of economic activity but as Bombay's population grew only suburban sprawl could house the ever-growing numbers of people.

As early as 1909 the authoritative and semiofficial *Gazetteer of Bombay City and Island* noted that traffic between the ten stations of the GIP on Bombay Island—VT to Sion—was extensive but that the most noticeable increase was between VT and suburban locations beyond Bombay Island.[38] The *Gazetteer* attributed this to the "acute" housing shortage in the city such that people were finding accommodation as far as 33 miles away at Kalyan.[39] To meet the transportation needs of the growing number of commuters the GIPR had added thirteen extra trains daily since 1900 and equipped them with the more comfortable, modern bogie-carriages and vestibule cars to replace the old-fashioned, four-wheeled coaches. A substantial interstation traffic also existed between the eleven stations of the BB&CI located within Bombay Island. Pedestrian locomotion, bicycles, various forms of rickshaws which eventually included motorized forms, and electric tramcars, busses, taxicabs and cars came to provide more localized forms of transportation. Only the trains, however, historically and today, could provide the mass transportation the commuters of the ever-growing Greater Bombay needed.

Thus, by fits and starts and with setbacks suburban railroads emerged as a major factor in the city's life. Indeed, by 1919 the GIPR produced advertisements encouraging people "To Live Out Of Bombay."[40] The daily rhythm of the city and many of its inhabitants came to be tied to the rush-hour schedules of the commuter trains. If VT symbolizes the monumental presence (indeed is a monumental presence) of the railroads in Bombay's history and ongoing life, it is in the crowded interiors of the carriages and of the stations that the railroads became a part of Bombay everyday life. The 1973 Hindi film, the Locarno award winning "27 Down" captures something of this when one scene shows an empty VT platform swarmed in a split second by peak-hour passengers.

Bombay's insular-peninsular site limited the development of new railroad lines so the carrying capacity of the existing commuter lines—which also carried main line services—into central Bombay had to be expanded. Lines were quadrupled, new stations opened, old ones remodeled and improved to reduce station-time, and signalling was upgraded. Electrification provided a quantum leap forward in the speed and frequency of service.[41] The effect on suburban passenger traffic was "electrifying": within a year the number of passengers carried jumped by 248 percent.[42] At the end of the colonial period in the reporting year 1947–1948 the suburban lines of Bombay carried 236 million passengers.

Ghat Electrification

Electrification of the Ghat sections of the GIPR extended to Igatpuri on the Thal Ghat line and to Poona on the Bhore Ghat line was completed in

1930. The greater power of the electric locomotives increased the efficiency and speed of trains up and down the Ghats thus nearly eliminating the Ghat bottleneck. An hour was cut from the travel time of Bombay–Poona express trains reducing the journey to 3 hours. This made it possible for businessmen and horse-racing fans alike (Poona had a well attended racing season) to make the round trip a same-day excursion.

Apart from Bombay, Madras, and the Ghats no other lines were electrified in the colonial era. The suburban routes of Greater Calcutta did not receive their first electric line until 1957. Indeed, steam remained the main form of locomotive power in South Asia until well into the 1970s. However, beginning in the 1950s the decision was made to focus on electric and diesel electric locomotion. Steam slowly lost its dominance and disappeared from regular use in the final decades of the 20th century.

Labor

Railroads became the largest employers of modern, industrial-type labor in India. Railroad employees soon recognized the need to undertake collective action to maintain or to improve their working conditions and wages. The relationships between the railroad companies—private or state-managed—and their employees frequently were turbulent and punctuated by strikes and other forms of job action. If the workers had sometimes displayed a good deal of militancy in the 20th century—the 1890s especially so—they were more inclined to act directly and collectively between 1905 and 1947.

The reasons for worker militancy were many and one advances general explanations at one's peril. Any given strike had its own particular set of causes: similar but not identical causes could be at work in strikes decades apart; other strikes had idiosyncratic causes specific to a locality and/or to a time-specific set of conditions. Thus, the general causes suggested below were usually present, but to varying degrees, in any given expression of worker militancy.

Firstly, one must note the establishment and growth of formal trade unions among the railroad workers. These unions provided the leadership and institutional bases for worker action. They made it possible for more workers to combine and protest and thus confront their employers more effectively. However, the history of railroad unionism in India through the 1920s and 1930s was also a history of fragmentation and division. Divisions based on occupational distinctions within the railroad workforce were exacerbated by the appearance of unions based on communal characteristics.

Secondly, there were the tight disciplinary and hierarchical attitudes of the railway managements. Friction between workers and managers over fines and other forms of discipline was intensified by the fact that most managers and foremen were European or Eurasian. Divisions based on race were

not easily papered over despite the avowed paternalism of the Europeans. One senior manager writing in the early 1930s stated that the days when "uncontrolled by legislative acts" and "undisturbed by organized labor" a railroad officer had been the "mai-bap" (mother and father) of his workers managing "the staff under him with paternal justice, based on a common sense view of equity, and his knowledge of his men" had passed away.[43] In any case, the statement reflected a Eurocentric, rosy-colored view of worker-management relations that many Indian workers never shared.

Thirdly, worker militancy was affected by the surges and recessions of the waves of nationalist agitation. Railroad workers, quite naturally, were considered by nationalist organizations such as the Indian National Congress to be prime recruits to the national cause. They were, after all, well organized and strategically located within a main instrument of colonial rule. Conversely, railroad workers expected nationalist politicians to support them in their struggles with the railroad administrations. During a tour of South India in February 1946 Gandhi stopped at the railroad workshops at Golden Rock where a large assembly of workers asked him to support their extensive list of grievances and suggestions for improvement.[44]

One cannot assume an easy correspondence between nationalist agitation and the strikes and other actions by the railroad workers. Other issues were always present and part of the mix. Concern about working conditions and discipline were omnipresent as were, fourthly, the course of the overall economy and its effects on the incomes and job security of the workers. Strikes in the aftermath of World War I coincided with a wave of nationalist agitation but they also coincided with a time of war-fuelled inflationary pressures and a lifting of the hard-driven work of the war period. Strikes in the early 1930s coincided with economic depression, job insecurity, and retrenchments.

What we can say with confidence is that the railroads employed a substantial number of permanent workers and many casual workers: 437,535 in 1905; 727,184 in 1921; and 1,046,843 in 1947. These workers were a visible and important part of the modern sector of India's economy—a new social presence in India brought into existence by the engines of change. The *Report* (p. 136) of the Royal Commission on Labour noted that wage levels and employment practices on the railroads reacted "to some extent on industrial labor conditions throughout the country."[45] During the colonial and postcolonial period the railroad employees played a role in national and regional political life commensurate with their size and considerable organization.

Railroad workers came in many occupational varieties from coolie labor to clerks, drivers and guards, skilled craftsmen, sophisticated engineers, and high-level managers directing the work of tens of thousands. One example will have to suffice. The *Report* of the Royal Commission on Labour discusses a category of heavy engineering establishments labeled "Engineering

and Metals" within which the 145 railway workshops employing some 136,000 persons were the most important. The two volumes of evidence devoted entirely to the railroads published by the Commission provide considerable information on the workshops.[46] The shops were found throughout India—Golden Rock was one—and they represented the advanced edge of heavy engineering industry in India. Workers trained in these shops spread throughout the economy. The presence of a workshop, some employed upward of 10,000, deeply affected local economies and urban life. A previous chapter briefly touched on the workshops of Lahore. Some of the same workshops became the munitions plants in World War II mentioned below. The railroads changed much and added much to colonial India.

Difficult Times Return: The 1930s and 1940s

No sooner had prosperity and better budgets benefited the railroads when difficult times returned. The effects and underlying causes of the stock market crash of October 1929 that reverberated along New York's fabled Wall Street soon rippled across the globe. The Great Depression of the 1930s rapidly became a global phenomenon. Protectionism in the developed world led by tariff walls erected in the United States impacted severely on the countries of Asia and Africa that sold raw materials on the global market to feed the industries of North America and Europe. India's economy was depressed and the railroads—whose lines carried the raw materials to the ports for export—again experienced financial stringency. Net tons of goods carried and passengers carried dropped considerably—the low point was reached in 1932–1933 with 90,970,000 tons and 492,515,000 passengers—with 1929–1930 levels not surpassed until 1937–1938 for goods carried and 1942–1943 for passengers. The expansive, positive thinking of the Acworth Committee was replaced by new committees of enquiry charged with finding ways to save money. The titles of their reports do not sugarcoat their objectives as in, for example, the *Report of The Railway Retrenchment Sub-Committee of The Retrenchment Advisory Committee, October 1931* and the *Second Report of The Committee Appointed To Suggest Methods By Which Efficiency Can Be Improved And Economy Effected On Indian Railways, Including A Section On Methods Of Increasing Earnings On Indian Railways*, 1934.

Economic recovery, in India as elsewhere, began in the later 1930s. However, World War II began and world peace was shattered. Germany invaded Poland on September 1, 1939, and Britain declared war on Germany on September 3, 1939. Once again, without consultation with Indians, the British Indian Empire was declared (September 3) at war with Germany. As in World War I, the resources and people of South Asia were used to support the British war effort. Rolling stock and track were taken for use elsewhere.

Some workshops became munition plants. The railroads were worked to their maximum and beyond within a context of limited capital expenditure: too much use replaced the diminished use prevalent throughout much of the 1930s. The railroads were profitable but the price was high: a system more worn out in 1945 than it had been in 1918.

Insofar as India and her railroads were concerned two features distinguished the Second from the First World War. Firstly, the Japanese entered the war in December 1941. The Japanese struck across the Pacific and attacked Pearl Harbor and the anchored U.S. fleet; they also swiftly invaded Southeast Asia quickly overrunning Malaya and capturing the British stronghold of Singapore on February 15, 1942. Most of Burma fell quickly thereafter placing Japanese military forces close to the borderland with eastern India. Soldiers, wounded civilians, and refugees fleeing from the Japanese advance were transported in trains, sometimes right across India "for days and nights without any food supplies. It was only the kindness of the civilian population in the stations they passed through which ensured that the refugees did not starve on the final stretch."[47] The railroads subsequently played a crucial role in the build-up to the offences that defeated the Japanese in Southeast Asia.

Secondly, the forces and institutions of South Asian nationalisms were both immeasurably stronger and more complexedly divided by World War II than they had been during World War I. Some nationalists, emboldened by British defeats at the hands of the Japanese, became more militant but others played a different game. Ironically, the British defeats which had emboldened some nationalists had also led to a concentration of British troops in South Asia. Those troops facilitated the forceful crushing of the Quit India Movement of 1942 and its accompanying attacks on what the British, yet again, recognized as their crucial railed lifelines within the subcontinent. But, the crushing of the Quit India Movement notwithstanding, the end of British rule in India had become almost inevitable—indeed, the British had promised almost as much in 1942 in their bid to win Indian support for the war effort.

By VJ Day (September 2, 1945) it was clear to virtually everyone that the days of British rule in South Asia were almost over. Britain had neither the will nor the capacity to hang on and most Indians, joined by that time by those wanting a separate state of Pakistan, demanded independence. The rolling stock and infrastructure of India's railroads were badly depleted. Many British railroad men had left India to serve the British war effort and they, seeing the end of the Raj, did not return. The Indianization of the upper levels of railroad service was thereby advanced—a positive development given the severe test to which the railroads were soon to be put.

The thrust toward independence picked up momentum. The British declared in February 1947 that power would be transferred to Indian hands by June 1948 at the latest. Lord Mountbatten went to India as Viceroy in

February 1947, speeded up the transferral, and on August 15, 1947, two new sovereign states, India and Pakistan, inherited a divided South Asia. The nationalists had triumphed but the triumph was tragically marred along the lines of division between the two new countries. The "Partition," as it is starkly known in the history books, resulted in massive violence and wholesale slaughter when Hindus, Moslem, and Sikhs attacked one another. The railroads, especially in the Punjab, were at the center of the violence.

CHAPTER 7

Partition and a Railroad Network Sundered

Introduction

British rule ended at midnight, August 15, 1947. In a speech late on 14th the great nationalist leader and independent India's first prime minister, Jawaharlal Nehru, said:

> Long years ago we made a tryst with destiny, and now the time comes when we shall redeem our pledge, not wholly or in full measure, but very substantially. At the stroke of midnight, when the world sleeps, India will awake to life of freedom. A moment comes, which comes but rarely in history, when we step out from the old to the new, when an age ends, and when the soul of a nation, long suppressed, finds utterance. It is fitting that at this solemn moment we take the pledge of dedication to the service of India and her people and to the still larger cause of humanity.

These were moving words from a man of generous vision: a commanding figure in the history of the 20th century committed to a secular, inclusive, democratic India where government would work actively to uplift the poor and the downtrodden. Tragically, the first challenge faced by Nehru and his colleagues was the gusts of violence that swept parts of India in the months leading up to and beyond August 1947. The Indian subcontinent, administered at the top by the British as one political entity—the British Indian Empire—and increasingly integrated through mechanisms like the network of railroads, had divided along communal lines. Two independent

nation-states were born in South Asia in August 1947: India, secular but predominantly Hindu, and Pakistan, avowedly intended to be a homeland for South Asia's Moslems. Pakistan itself was divided into two distinct components separated by over a thousand miles of what, more often than not between 1947 and 1971, was unfriendly India. The eastern portion of Pakistan, the largely Bengali-speaking East Pakistan, subsequently separated from (West) Pakistan in its own, blood-soaked independence movement and became the independent state of Bangladesh in 1971.

The Partition provides a significant lesson, namely that there are limits to the integrative consequences of transportation and communication technologies. Undoubtedly, as the preceding chapters have demonstrated, the railroads of colonial India facilitated the interconnections that slowly knit the economy and polity of India together. The railroads did help to unite India and Indians. Madhav Rao's prediction, "if India is to become a homogeneous nation, and is ever to achieve solidarity, it must be by means of the Railways as a means of transport, and by means of the *English language* as a medium of communication," was correct, but not completely correct. When push came to shove, when tensions and differences located in South Asia's social and cultural realms overwhelmed and captured accommodative politics then South Asia's nationalisms multiplied and fragmented. Hindus, Moslems, and others turned on one another. Rail travel became dangerous in the face of an inflamed humanity. For some months the engines of change pulled the trains of death.

Partition, Railroads, and the Trains of Death

Listen to the novelist Krishan Chander, in whose powerful Urdu short story translated as *Peshawar Express* the locomotive of a 1947 refugee train becomes the narrator.[1] As the train travels from Peshawar to Bombay via Taxila, Wazirabad, Lahore, Amritsar, Jullundhar, and Ambala the locomotive narrates the humiliation and massacre of its passengers: successively Hindus, Sikhs, and Moslems. At Taxila the locomotive says, "All two hundred were dead. The entire platform was smeared with blood. There was blood on the railways tracks. When I moved, my wheels started wobbling." The two hundred were Hindus and Sikhs. Once the train crossed into India, Moslems became the targets. The train stopped at a Pathan village near Jullundhar: "the refugees [from the train] and the local *jats* [a caste-grouping] came out and attacked the village." Men and children were killed, the women raped and then killed. "I moved on puffing the smoke of blood and hatred." "I moved on" while people drank and shouted "Long Live Mahatma Gandhi" without any sense of their irony-laden slogan. Gandhi, the apostle of nonviolence, was appalled by what happened in 1947. In a culmination of the spiral of hatred and violence, Gandhi was assassinated in January 1948

by a Hindu fanatic while he, Gandhi, led his public, morning, ecumenical prayer meeting.

One might go further, and argue that for all the integration railroads effectuated they also contributed to division and to unequal socioeconomic growth. Some came to feel, correctly or not, that they were members of a vulnerable and/or relatively deprived minority who were or might (and in a tension-filled context fears about what might happen had considerable currency) find themselves economically weakened or politically oppressed. Parts of South Asia and/or particular groups fell behind and inhabitants of those areas became aggrieved: grievance that found outlet in intensified communal identity and anger toward members of other communities. A broad-brush example of this kind of outcome is found in the writing of a British critic of British rule in India. William Digby, a one-time member of the elite cadre of British colonial administrators (the Indian Civil Service, largely British in composition until late in the colonial period) distinguished in 1901 between[2]

> ANGLOSTAN, the land specially ruled by the English, in which English investments have been made, and by which a fair show and reality of prosperity are ensured;
>
> HINDUSTAN, practically all India fifty miles from each side of the railway lines, except the tea, coffee, indigo, and jute, plantations, and not including the Feudatory States.

There can be little doubt that the railroads contributed in South Asia to the success of some peoples and places, and to the relative decline of others. Railroads in most parts of the world had similar effects, effects which, in the South Asia context, one late 20th-century writer, Elizabeth Whitcombe, summarized as "expansion and induced imbalance." Modernization, industrialization, and the railroads went hand in hand but not as uniform processes.

Krishan Chander's steam locomotive makes a final, hopeful comment that captures the unevenly complex world the railroads had helped to make: "I am made of wood and steel. There is no life in me. And yet, rather than witness bloodshed and be burdened with dead bodies, I want to carry grain to the famine stricken areas. I want to visit coal mines, steel mills and fertilizer plants. And transport in my compartments happy and carefree peasants." "People who would salute the brave new world where there would be no Hindu and no Muslim. They would be all peasants and workers. Just human beings."

But, of course, in 1947 they were Hindus and Moslems—and other communities—who, as the politics of identity intensified, lost sight of their shared humanity. The Punjab and the refugee trains that steamed slowly across its landscape became spaces within which massacres, rapes, and

pillage occurred daily. Estimates suggest that half a million people died at the time of Partition; 12 million became refugees, as Hindus and Sikhs struggled to reach what would become India, and Moslems struggled to reach Pakistan. "The Partition," as the events of 1947 are most often known, was seared into the minds of those who lived through it; it became a living, vivid memory—an open, suppurating wound—that influenced much of what subsequently happened in postcolonial South Asia. It poisoned the relationships between the two successor states, India and Pakistan, such that they subsequently fought one another twice in two general wars and almost continually in Kashmir, where Pakistan supported an insurgency in that Moslem majority yet India-controlled area.[3]

Whatever the accumulative contributions of the railroads of colonial India to the causes of 1947, there can be no doubt about what happened on the trains in those terrible months, or on the major consequences of Partition for the railroad systems of South Asia.

Krishan Chander's story captures the essential details of what happened on the trains, along the lines, and at the stations. Eyewitness accounts tell the same story. A British military officer wrote: "Some of the events such as murder, brutality, looting, ill-treatment of women and small children in evacuee trains, the results of vicious hatred and communal fury, have outdone even Belsen and other bestialities created by the warped Nazi mind."[4] He referred to a specific massacre as the most cold-blooded he had ever witnessed. "In every carriage without exception the dead and dying were mixed up with the wounded—it was certainly a train of death. . . . "

The massive movement of refugees fleeing variously westward or eastward traveled by whatever means were available or affordable—a great many, indeed the majority, walked. Trains offered one of the quickest ways to safety but they also were extremely dangerous. 673 refugee trains were run between August 27 and November 6, 1947, during which time they transported 2,300,000 people.[5] Typically a refugee train would carry 5,000 people, of whom roughly a third had to travel on the carriage roofs. One photograph from the period shows an enterprising if somewhat uncaring individual charging refugees a small sum before they could use his makeshift ladder to reach a carriage roof.[6]

Unusually wet weather in late September 1947 added to the misery of the refugees. Floods disrupted road and rail services and drowned refugees and their cattle. Rail service was restored through the great efforts of the railroad staff and army engineers who repaired lines and erected temporary Bailey bridges to replace destroyed rail bridges. The 101st Railway Construction Company of Queen Victoria's Own Sappers and Miners from Bangalore in South India provided many of the military personnel.[7] In addition to their repair work they also provided train crews and security details.

Trains and stations were highly visible, compact targets firmly fixed to their ribbons of steel and concrete platforms. They became the sites of

some of the worst massacres. As Prabhjot Parmar writes: "The ambushes and killings in trains and at various railways stations in Punjab make the communal massacres difficult to forget or ignore. No image of Partition, textual or in the mind's eye, photograph or film, escapes from the overloaded trains with men, women and children moving from one side of the border to the other, nor do the trains of massacred humanity that many times carried the dead from one side of Punjab to the other."[8] As the Punjabi poetess, Amrita Pritam, wrote in the riot-torn days following Partition: "See the plight of your Punjab/Corpses lie strewn in the pastures/and the Chenab has turned crimson."[9]

The worst of the violence was over by the third week of October 1947 as the orgy of violence weakened in the face of a diminished bloodlust, more organized transportation, and better public safety enforced by civil and military authorities. Thus, despite the trains of death roughly 4 million refugees reached their destinations via the railroads in 1947–1948.

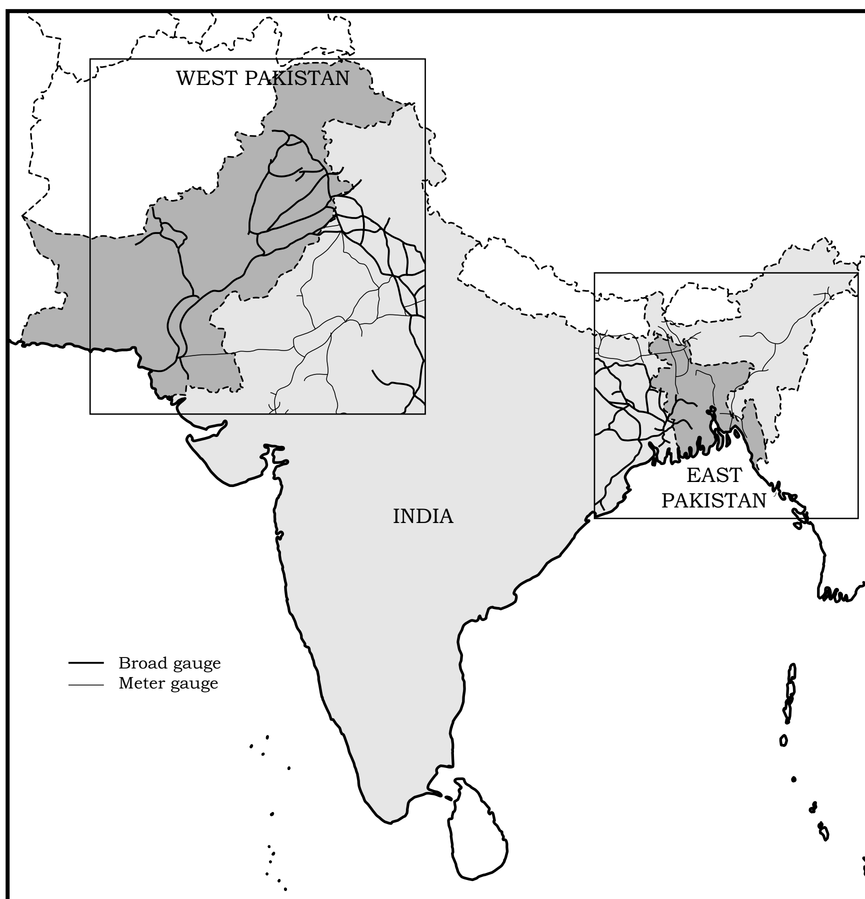
Rail Networks Sundered

Among the refugees were many railroad employees and their families: Hindus, Sikhs, and others stationed in what had become Pakistan; Moslems stationed in what became India. Initially, a large number of "Indian" railroad employees remained in the Pakistan province of Sind because Mahatma Gandhi, believing in the best, advised Hindus to remain in Sind. Once their presence became untenable in the face of communal violence the long journey to India by train was no longer a safe option. Instead, special flights transported them from Karachi to Delhi where they lived in special camps until distributed among the railroads of India.

Partition sundered the rail systems and forced the transferral of tens of thousands of railroad employees. Previously integrated railroad systems administered within a unified hierarchy of managers and workers were rent asunder. An invisible but very real barrier—the Indo–Pakistan border—divided operating systems. Worst affected was the North Western Railway (NWR). The largest in colonial India at 6,881 miles, it had 1,855 miles in India after August 1947. They were operated for a period of time as the Eastern Punjab Railway, a unit that had little viability and was eventually incorporated into a larger structure. Similar truncation occurred in eastern India where the Bengal–Assam Railway, 3,555 miles before Partition, was divided with 1,942 miles remaining within Indian territory. Map 7 shows the worst affected areas.

The history of South Asia's railroads also divides as of August 15, 1947. The railroads in one jurisdiction, India, went one way and those in Pakistan, another way. The railroads of Pakistan were divided again when East Pakistan became the independent country of Bangladesh in 1971. The

Map 7
August 1947, The Partitioned Areas of South Asia and Their Railroads.



remainder of this book focuses primarily on the railroads of India: space permits little exploration of what happened elsewhere.

Pakistan and Bangladesh, Post-1947

Suffice it to say that the railroads of Pakistan faced the greater difficulties after 1947, just as Pakistan generally has encountered more severe challenges and major political and economic instabilities. Except for the brief period of the "Emergency Rule" (1975–1977) India's democratic processes of government have displayed considerable vitality and adaptability while Pakistan,

more often than not, has been a military dictatorship. Despite stresses and strains India has held together; Pakistan did not. But, in fairness, the advantages lay with India. Pakistan, divided into two wings, was on the periphery of what had become a fairly well-integrated political-economic entity during the colonial period. The routes of the railroad lines exemplified—indeed helped to cement—those relationships. Pakistan inherited railroads designed to serve the interests of a unified British Indian Empire: they were not well suited to the needs of an independent nation-state located on the western and eastern edges of the subcontinent. Many route miles in Pakistan had been built to serve the British colonial needs for border security with little relationship to potential commercial benefits or local needs. The fact that in Pakistan motorized road traffic quickly came to assume a greater role in freight and passenger transportation than in India was one indicator of the inadequacy of its inherited network of rail lines. In 1980 Pakistan still had 250 steam engines in use, each over 60 years old—steam engines, moreover, that had to be converted largely to oil-burners when Partition eliminated Pakistan's sources of coal located in eastern India.

In 2005 Pakistan's railroads operated along 7,140 route miles, down from 7,829 route miles in 1994. The number of locomotives and rolling stock in service fell during the same period. In short, rail transportation has not been a resounding success in Pakistan. Road transportation, however, continues to thrive.

The city of Lahore illustrates the problems faced by Pakistan and its railroads. The rapid development of railroads to and from Lahore were dictated by colonial concerns. The Punjab was annexed to British India only in 1849 after two bitterly fought wars (1845–1846 and 1848–1849); it then became the provincial capital of the Punjab, a rich agricultural area; it was a close, but not too close, troop staging area for the protection of British interests on the turbulent northwest frontier.

Thus, British Lahore, grafted on to the much older indigenous Lahore, was born out of colonial wars and colonial uprisings. Military and administrative considerations bulked large in the early presence of Lahore on colonial India's emerging railway map. The fortress-like station symbolized the concerns of the colonial authorities. But whatever the initial motivations for Lahore's rail connections the railroad became an engine for economic growth, and related demographic growth, of the central Punjab and the city of Lahore. Railways made the bulk shipment of grain and other agricultural products to the colonial port-cities (and the line to Karachi came to offer the shortest route to the sea) possible. As the center of a rail network and the headquarters of the NWR Lahore became an urban area in which substantial rail-related employment was located thus stimulating in-migration and land-use shaped by the growing demands of the railroad for workshops, marshalling yards, and offices.

Partition, however, turned Lahore into a frontier city 15 miles from the Indo–Pakistan border. Cut off from its eastern hinterlands, Lahore, fifth largest in population size in India in 1941 with 671,659 people, went into relative decline within Pakistan such that by 2005 Karachi (359,492 people in 1941) had become, at 9 million plus, the largest city in Pakistan. Certainly Lahore, with a population of over 5 million in 2005, did not lose people in the longer run. After a period of stagnation it grew again but Partition robbed it of its preeminence. Interestingly, the decision to continue large-scale railroad workshops at Lahore—an industrial complex that illustrates well the imbedded and hard to relocate heavily capitalized infrastructure colonial railroad development created—helped, along with cultural and educational institutions also dating from the colonial period, to keep Lahore's economy afloat.

East Pakistan inherited much less railroad mileage. The riverine and deltaic nature of the lower half of what became East Pakistan had limited railroad construction in the colonial period and had sustained an effective competitor to railroads in many areas, namely transportation by boat along and across the rivers. Partition in the East arguably had a greater impact on India's railroad system for reasons explored below. Regardless, rail transportation in East Pakistan and, from 1971, in Bangladesh suffered from most of the problems present in the West: underfunding, contraction, and general deterioration. Bangladesh had 1,678 miles of track in 2004.

India's Railroads: The Immediate Post-Partition Challenges

The railroad employees flown from Sind to Delhi in 1947 illustrate one of the many, difficult problems Indian Railways (IR) had to overcome during the turbulent transition from colonial to postcolonial India. Staff changes and adjustments at all levels of railroad operations were required. The "communalization" of the workforce discussed in Chapter 6 was one problem. Certain occupations within the railroad workforce had become staffed more heavily by members of one community. Moslems were well represented among the locomotive and workshop trades; Hindus, Sikhs, and others were more prevalent in traffic and clerical positions. Some non-Moslems in technical jobs were killed: twenty-five, for example, at the Lahore Moghulpura workshops on August 13, 1947. The result was that IR faced shortages of skilled labor that created difficulties for years. Overall, engine crews, for example, in 1948 were 18 percent below pre-Partition levels with the shortages being considerably larger on specific lines in northern and eastern India.

The violence and upheavals of the Partition, however, must not mislead us away from the crucial development in India's history: colonial rule ended; India became an independent country. The railroads had been a colonial enterprise with middle and upper management, and many foremen, being

heavily staffed by people from Britain. The nationalist demand to "Indianize" the railroad workforce had referred to those favored positions because 90 percent or more of the total number of employees had always been South Asian. Some replacement took place during the war years as British staff left for military service or to assume positions within the beleaguered railroads in Britain. Nonetheless, extensive changes had to take place in 1947–1948 when IR replaced most of the superior British staff with Indians. The fact that IR made these changes and operated effectively despite great problems and pressures repudiated the hollow justifications for the colonial policy that favored Britons for those positions. From K.C. Bakhle, the Chief Commissioner of the Railway Board (served September 1947 to April 1951) downward Indianization of the railroad workforce was finally completed.

The problems faced by IR during and after Partition were not limited to staffing issues. Hard-worked and underfunded during the war years the railroads had to deal with the crisis of Partition from a weakened position. Run-down rolling stock was cut off from its usual repair facilities as workshops ended up in Pakistan (or in India on the other side of the coin) in a division that paid no heed to previously integrated operations. Miles upon miles of the permanent way required repair, replacement, or upgrading. Exports previously routed through Karachi now had to go to Bombay along overworked lines to port facilities not built to handle the increased volume of traffic. In eastern India the existing rail link to the northeast Indian province of Assam ended up in East Pakistan. A new, 143-mile line, the Assam Rail Link, had to be built quickly through a rainy, hilly, malarial jungle bisected by twenty-two rivers requiring bridges with deep foundations. Started in January 1948 the Link opened in December 1949.

The problems, in short, were many and they were serious. Nonetheless, they were quickly and effectively overcome. The railroads of India and their many employees made it through the ordeal of Partition and went on, as Krishan Chander's locomotive from Peshawar hoped, to serve "the brave new world" of postcolonial India. It is fitting that Prime Minister Nehru's words should both open and close this chapter. In a speech inaugurating the Northern, North Eastern, and Eastern Railways (part of a zone-based reorganization that was put into place in 1951–1952—see Chapter 8) given on April 14, 1952 Nehru called IR India's "greatest, national asset. They are a State undertaking run by the State, controlled by the State, wholly managed through officers of the State—although naturally they form a separate department of the State." He went on to describe the situation 5 years earlier when the "obnoxious state" of the railroads often came up at cabinet meetings, when mountains of goods piled up at the ports, and when "it was a painful experience not only to travel, but to see other people travelling"—a bad situation compounded manyfold when Partition struck and the trains were "filled with suffering humanity." "All this burden" said Nehru, "fell

on our railways just when they were least capable of carrying even their normal burdens. And yet we survived and the railways survived. And one has only to see them now to see how they have risen and overcome all that multitude of difficulties—not only overcome those problems and difficulties, but built themselves anew—and are functioning now with a large measure of efficiency and punctuality."

CHAPTER 8

To Serve the Nation: Railroads in Independent India, 1947–2005

Introduction

Much changed in South Asia on August 15, 1947, more changed in the decades ahead, and, by the first decade of the 21st century when India had been free of colonial control for over half a century, the accumulated changes were enormous, and the pace of change seemed to be increasing. The railroads have been (and continue to be) central to many of the transformations of postcolonial India.[1] Some of those changes represented the continuing development of processes begun in the colonial period. Other changes were rooted in postcolonial politics, in institutional transformations, or in technological innovations. The railroad authorities responded to the needs of independent India as articulated and formulated by successive governments, politicians, the media, and public opinion.

The engines of change moved along lines already established during the colonial period—the inertia imbedded in the massive infrastructure capitalized from 1850 onward—and down new lines. The railroads have continued to make and remake India since 1947 albeit within the confines of a physical and institutional inheritance that, for the most part, must be changed gradually and often at a considerable cost. The conversion of meter gauge lines to the 5 feet 6 inch gauge, eventually pursued as a settled (1992) unigauge policy, is a major example of a gradual and costly change. But, fast or slow, changes to India's railroads have been constant since 1947.

The railroads in 1947 became India's national network—institutionalized as Indian Railways (IR), directed by the Railway Board—in every sense of the term national. Therefore, if one is to find a central theme in the complex

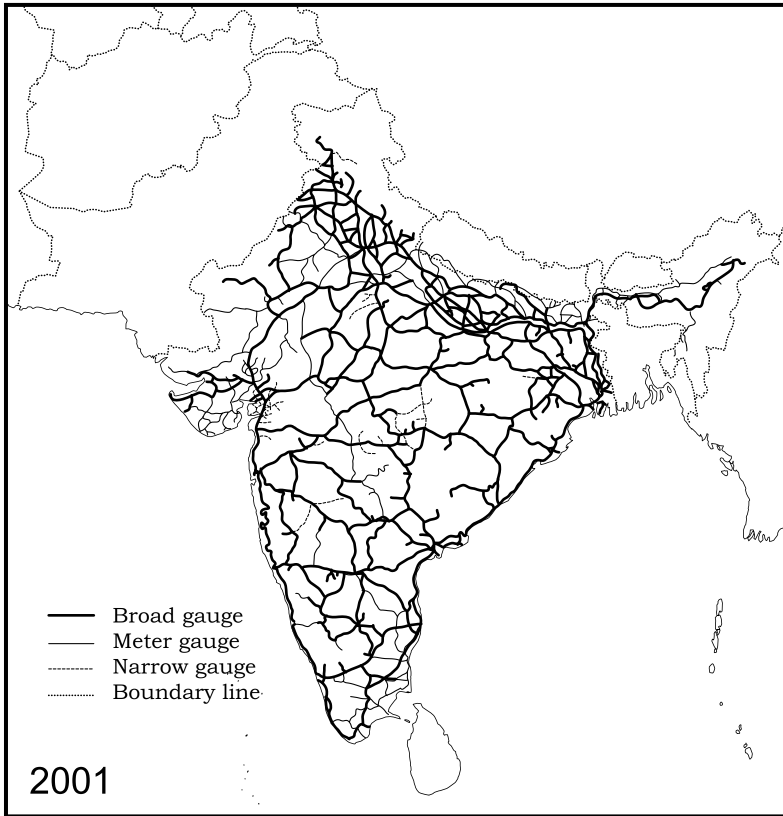
history of India's railroads in the postcolonial period, it is the IR's mission. IR is there to serve the Indian nation, to contribute to nation-building, to carry coal, steel, fertilizer, and "happy and carefree peasants" in the wish of Krishan Chander's locomotive.[2] The railroads were, as Nehru said, India's "greatest national asset". Railroad officialdom quickly—and no doubt sincerely—recognized that to be seen to be serving the nation enhanced IR's claim to budgetary resources. More than one official IR publication had a title stressing national service: *Indian Railways. 125 Years of Service to the Nation 1853–1978* was one example although the appropriation of the entire 125 years as service to the nation was somewhat of a stretch.[3] As this book has shown the railroads of colonial India served primarily colonial purposes for an extended period. The effort to relate IR to the national well-being goes on. In 2006 IR's web site has as its banner, "Indian Railways: lifeline to the nation."[4] The extent of those lifelines at the beginning of the 21st century are depicted in Map 8.

However, the populations of democratic nations speak with many voices, and the nation means different things to different citizens. Self-interested groups seek to shape national agendas toward their narrowly-defined interests. Therefore, IR has been pulled in many directions since 1947. It is not always clear what best serves the national interest where the operation of the railroad is concerned. How, for example, does one reconcile the pressure on IR to provide below-cost passenger travel as a public policy designed to assist many groups—particularly suburban rail commuters—with their transport costs, with other pressures to operate the railroads as a commercial enterprise less dependent on state subvention. IR carries a special burden in its role as India's monopolistic, national railroad: it is not permitted by the GOI to price its various services at full-cost recovery because of the expectation that IR must assume some social costs as its contribution to national socioeconomic goals. Moreover, out of the revenue it does generate IR must make annual payments to the revenues of the GOI: a practice rooted in the colonial period and never fully abandoned.

The Railroads and the Politics of Independent India

The most potent of the forces that affected the evolution of India's railroads after 1947 came from the political transformation, from the transition from colony and British paternalism to national independence and a democratic republic. Many of the changes IR has undergone in the postcolonial era reflect the realities of the new political order as articulated, in particular, by Indian politicians. They operate within a robust democracy where responsiveness to the needs of the electorate—be those needs real, perceived, and/or manufactured by the politicians and powerful interest groups—is important to political success.

Map 8
Railroad Routes in 2001, Distinguishing Between Broad and Meter Gauge Lines.



The Railway Board, which has grown in size since 1947, administers IR within the big budget Railway Ministry of the GOI. IR is a highly visible, state-owned and state-operated system that directly affects the lives of many Indians, and indirectly affects everyone.[5] The politician who occupies the position of Minister of Railways—India has a political system similar to that of Britain; the governing party, or the governing coalition of parties, provides the prime minister and the cabinet ministers—usually is a powerful political figure. One railroad minister, Lal Bahadur Shastri, subsequently became prime minister (1964–1966). As one observer of the Indian railroad scene put it: "The great divide that Rail Bhavan illustrates to visitors is how the Railway is split between the true sons of rail transport and the illegitimate appointees of the ministerial faction."[6]

The railroad authorities are continually buffeted by political pressures and must sometimes adopt policies and practices they—and others—consider undesirable. One consistent problem relates to the closure of uneconomic branch lines where financial analysis runs contrary to political pressure. There are arguments based on social benefit analysis that can be used to justify the retention of a loss-making line but the discussion is rarely couched in those terms. Rather, closure or retention is decided by political clout—or the lack thereof. Strikes by railway workers, when widespread and prolonged, have resulted in forceful interventions by the GOI.

Politics, A Case in Point—The Zonal Reorganizations

Another issue where political pressure has affected the railroads involves fundamental questions about the optimum macro-organization of IR. Calls to reorganize India's railroads have a history that long predated independence. Indeed, the Acworth Committee suggested that the railroads be divided into three operating divisions beneath the Railway Board, namely the Western, Eastern, and Southern Divisions. However, this proposal and others to regroup and simplify the railroads met with resistance as long as the British were in control, and some state-owned lines were operated by private companies. 1947 removed the political obstacles and created a more pressing need for reorganization. The Partition had resulted in multiple, various-sized, ill-suited operating units. In addition, some railroads, like those previously run by the larger princely states, had to be integrated into the centrally-directed network.

Major regrouping began in 1951 informed by the Railway Board's expectation that each railway system—each zone as they were termed—should, insofar as possible, (1) serve a compact region, (2) be large enough to (a) support a high-caliber headquarters' staff able to implement improvements effectively and (b) to be well equipped with workshops, training institutions, and so on, and (3) to be part of a regrouping process that would minimize transitional dislocations and not lessen operational efficiency. The latter goal was not widely attained. As one senior participant noted: "These hopes were not realised as serious problems relating to the absorption and gradation of staff were created and these took years to resolve."[7]

Six zonal administrations were created between April 1951 and April 1952: Southern, Western, Central, Eastern, North Eastern, and Northern. Each zone was headed by a general manager. Each zone has a great deal of autonomy in matters operational and a general manager is like an army general who commands a division—or a powerful lord if you prefer another comparison since, when a general manager goes on a tour of inspection (in his own, well-equipped, live-in carriage), the journey has some of the qualities of a feudal lord progressing across his domain. The few who are

his nominal seniors are in the Rail Bhavan—well away from the operational action. This was the situation in 1951; it remained so in 2001. However, and it is an important qualification, general managers are "constantly subject to regional and political pressures of one kind or the other. . . . "[8]

The composition of the Eastern, North Eastern and Northern zones raised considerable political controversy in 1952. Indeed, the question of which sections of the East Indian Railway would be placed within the Northern zone created so much political pressure that the announcement of the specifics was left to Nehru, the prime minister, whose immense prestige made unpalatable decisions more acceptable. The six zones soon grew to nine zones. The South Eastern was hived off from Eastern in 1955 and the North East Frontier Railway, serving Assam, was carved out of North Eastern in 1958. Parts of Southern and Central Railways were used to create the South Central zone in 1966.

Minor adjustments aside, the nine zones remained intact into the 1990s as the largest (the zonal administrations, in turn, are divided, most notably into divisions with the latter handling the day-to-day management of railroad operations) operating units within IR. Some suggestions were made in the early 1980s to add a few zones but nothing happened until 1996 when a Minister of Railways authorized the creation of six new zones of which one, East Central, was to be headquartered at Hajipur: the location of the minister's parliamentary seat. Subsequent developments saw Bangalore announced to be the headquarters of a new South Western zone, only to see a later decision move the headquarters to Hubli. And, in an overtly political act, the prime minister promised at an election rally in Bilaspur that it would be the headquarters of a South East Central zone. Highly politicized debate followed for some years until, in 1992, the Railway Board, apparently under political pressure and in reversal of previous Boards' positions, ordered the creation of seven new zones.

By December 2005, therefore, IR had sixteen zonal administrations—or seventeen if one counts the independently administered Konkan Railway as a zone. The verdict on the costs and benefits of the multiplication of zones remains open but critics, among whom one can count some former Chairmen of the Railway Board, argue that the proliferation will cause serious financial and operational problems for IR. Regardless, the history of the zones shows how closely IR has become connected to the dynamic hurly-burly of India's political life.

How could it be otherwise for the nation's lifeline? Indians are not indifferent to something that affects them so much, an attitude the politicians understand only too well. As a contributor to a listserv exclaimed in response to a news report that a meeting of the Salem Railway Division Protection Committee (zonal reorganization has required divisional reorganization) had resolved to send a minimum of 5,000 telegrams to the Railway Minister, Lalu Prasad: "This is what happens when you allow

political influence in administrative decision making. Every two bit wacko has a personal preference about which zone he wants his area to be in."

Travel: Comfort, Speed, and Safety

The setting where most Indians—and foreigners—come into close contact with IR is as passengers. The transportation of people is up close and personal: very close in the case of the suburban trains carrying commuters to and from work in a great conurbation like Mumbai. The passenger is self-aware hence the conditions under which he or she travels is a matter of personal concern. IR has placed considerable emphasis on improving the conditions of rail travel, especially for the lower class passengers who often traveled in deplorable conditions during the colonial period.

The improvements have come on many fronts. First, the conditions of travel have been improved. The amenities and facilities at stations have been upgraded as have the provision of services to purchase tickets, make reservations (computer-linked booking and, recently, internet booking of tickets), and so on. Coaches have been made more comfortable and more safe. Admittedly, for those in the lower class accommodations on low priority trains travel can still be a crowded, unpleasant experience. Even so, it is better than it was, although peak period travel for commuters on Mumbai's suburban lines is trying: trains designed to accommodate 1,800 people and able to carry 2,600 at the price of considerable discomfort, do, in fact, transport 4,500 to 6,000 people. What can one say other than to note the journey for most people, mercifully, is short. A World Bank railroad expert said that Bombay commuter services exhibit a level of crowding that can only be believed by those who have seen it first hand.[9]

Mumbai represents a special problem because of the layout of the city. A system of light railroads is under consideration to alleviate the problem. Two of India's other great cities, Calcutta and Delhi, have been able to pursue a different solution to the problems of urban transportation: electric trains running within the metropolitan area ("metros" as they are often known) on tracks that are sometimes underground, sometimes on the ground, and sometimes elevated above the ground.

Calcutta was first. Construction began in 1973 and the initial project (subsequently extended), the 16.45-km (roughly 10.2 miles), Dum Dum to Tollygunge, became operational in 1995.[10] Built largely through the cut and cover technique (tunneling only totals 800 meters = 875 yards) the Calcutta Metro provides clean, comfortable, fast service along its route as eight coach rakes (rake = a train), scheduled at 180-second intervals during peak periods, can carry 2,500 passengers at an average speed of 30 kmph (19 mph). The success of the Calcutta Metro led to similar plans for Delhi. Construction of the Delhi Metro was approved in 1996 and sections of the

line have been opened to passengers from 2004 onward. The EMUs for the Delhi Metro have been built in South Korea, evidence of India accepting foreign rail technology when appropriate to do so. The Delhi Metro gives urban India its second, state-of-the-art, railed transport system.

Urban and suburban travel aside, the increasing introduction of air-conditioned (AC) coaches has introduced new divisions of comfort/hardness, space allotments, and other amenities. The old, non-AC first class now ranks well down in the hierarchy of comfort and is being discontinued. But even in AC the hierarchy ranges from AC first-class sleeper (many Indian train trips involve one or more nights of travel—the upper bunks fold up during the day; the lower bunks become seats) with its lockable compartments each designed to transport four or, in the coupes, two passengers to what is called AC three-tier sleepers where sixty-four passengers (cf. non-AC sleeper class that sleeps seventy-two passengers) are accommodated in eight bays. Six passengers in three tiers are squeezed into the inner bays; two passengers in two tiers are located in the outer bays.

IR took a delivery (the agreement was signed in the mid-1990s) of twenty-four coaches with a speed potential of 160 kmph (100 mph) from the German firm Alstom in 2001–2002. The purchase included a "Transfer of Technology" arrangement to enable IR to manufacture the new design coaches in its own coach factories, although the Alstom coaches have had problems.

Secondly, the speed of travel has been increased on many routes and, therefore, the time of travel has been reduced. Certain high density routes between reasonably proximate cities have been equipped with special, high speed trains permitting a same-day connection within roughly 2–9 hours of travel. These trains, known as Shatabdi Expresses, are pulled by powerful, 3,500 to 5,000 horsepower, electric or diesel locomotives capable of reaching speeds of roughly 100 mph, where track conditions permit. Each coach transports seventy or seventy-two passengers seated in individual recliner seats. The Shatabdi most likely to be encountered by foreigners is the one that runs daily between Delhi and Agra covering the intervening 199 km (123 miles) in just under 2 hours.

More distant destinations demand trips extending over one or more nights. For these trips another group of crack trains, the Rajdhani Expresses, require the least time although all their routes begin or end in the national capital. Reservation-only accommodations, limited stops, good equipment, and priority signalling enable a Rajdhani, to take one example, to leave Delhi in the late afternoon and to arrive in distant Madras in the evening of the following day.

The Shatabdis and the Rajdhanis, however, are largely trains for the better off—although a 1,000-km (620 miles) trip in an AC three-tier sleeper costs under US$25. Many Indians continue to travel in the lowest classes of "ordinary" trains which stop at virtually every station in their leisurely

progress. Nonetheless, here, too, one finds improvement. Moreover, in 1948 IR introduced what were called "Janata" trains comprised entirely of what was then third-class coaches (now second class after third class was abolished). They provided express service on the trunk routes. Regardless of class and degrees of comfort IR is the world leader in the provision of passenger service: no other railroad has as many passenger coaches or such a large, total seating capacity. In 2004–2005 IR ran over 9,500 passenger trains, inclusive of suburban trains, each day, in which, *daily*, some 14.7 million people were transported—a figure given comparative perspective when one knows the airlines of India transport on a *yearly* basis a total of some 1.5 million people. IR's yearly total is a staggering 5,378 million passengers.

Safety is a priority for IR and for its passengers. However, when a major accident does occur a hue and cry often develops and the public's attention turns to issues of rail safety, politicians get involved (these days one can expect the Minister of Railways, or one of the two junior ministers—also politicians—styled Minister of State for Railways, to appear quickly at the scene of a major accident; the general manager of the affected zone having got there almost as soon as it happened), and public enquiries are instituted along with all the standard enquiries undertaken by the permanent Commission on Railway Safety—a body staffed by railroad personnel but located in a different Ministry (although there has, lately, been suggestions to locate the commission within the Railway Ministry while others argue for a new, statutory body along the lines of the US National Transportation Safety Board). The commission is shielded from IR influence by the rule that once a rail official joins the commission he or she cannot revert back to IR, or hold any appointment under the Railway Board.

Despite the continuing advances in the areas of safer carriage construction, better signalling, computerization, fiber-optic communication channels, improved roadbeds, sleepers and rails (e.g., heavy-weight rails on heavy-use lines welded into continuous lengths of 1 km = 0.62 mile or more), and training of personnel, accidents do happen, multiple deaths occur, and public investigations follow. India has had three major accident enquiries instituted by Parliament since 1947. The first, chaired by Dr. H.N. Kunzru, reported in 1962 and made 377 recommendations to improve safety of which 355 were accepted. A second committee issued its findings in 1968–1969 and a third committee, struck in January 1978, in response to public outrage following two major accidents in October and November 1977, reported in 1978–1979. A long-term result of these enquiries and more routine investigations and improvements has been a significant improvement in rail safety. In 1951–1952 India had 6.5 consequential accidents per million train kilometers (i.e., those involving risk to life, property, etc., normed against a standard measure of 1 million kilometers of train movement). This figure was reduced to 0.78 in 1994–1995.

Unfortunately, a number of high-profile accidents undermined the public's perception of IR's safety record, overall statistical trends notwithstanding. Big accidents that killed many people resulted in a great deal of negative publicity. As recently as October 2005 over 120 people were killed when, following weeks of heavy rain in Andhra Pradesh, a bridge gave way at 4:20 AM under a train about 20 miles southeast of Hyderabad. The train derailed and three coaches and their sleeping occupants were thrown into the swollen river.

The large accidents fed the perception that IR is accident-prone. A Google search of India's main national newspapers, *The Hindu*, *The Hindustan Times*, and *The Times of India* for the period 2000–2005 turns up thousands of news items and commentary about the railroads, of which many deal negatively with safety issues. In fact, using the normed measure introduced above—consequential accidents per 1 million train kilometers—IR's record has continued to improve. The ratio for the operating year 2001–2002 was 0.55 and for 2004–2005, 0.29. The public, however, is more concerned by loss of life, so a couple of bad years with high casualty, major accidents adversely affects IR's safety image—although not to the point of affecting passenger loads. A five-year, Rs. 1,700 crore Safety Fund has been established to provide critically needed investment in track and other infrastructural components. The Fund is needed but it also helps IR's safety image.

Considered on a statistical basis the safety record of IR places it mid-rank among the railroads of the world: safer than some, less safe than others. The problem with comparative figures, however, is that IR is not just any railroad, it is one of the world's five largest—depending on the measurement used the rank could be as high as second—and one of the most complex. There are few railroad systems with which IR legitimately can be compared: most comparisons pair an elephant with mice. Moreover, as this chapter suggests, Indians have a close connection with their railroads: the price of providing the nation's lifelines is intense scrutiny.

The way forward to an improved safety record is not easy. IR's budget—debated annually and approved annually by Parliament—is never enough to meet the many needs of the huge network it funds (a case can also be made for budgetary reallocations within IR) although the politicians rarely see their underfunding as a contributory cause of accidents. Some rail corridors in India have very high traffic densities—among the highest in the world. Moreover, a substantial part of the traffic involves passengers, so when a serious accident does occur, loss of life is quite possible and public concern thereby the greater. High traffic volumes increase the possibility of accidents: a small technical fault or human error can have devastating consequences when a system is working close to its maximum capacity. India's weather—intense rains and, especially along the east coast, devastating typhoon winds—can quickly damage the permanent way or even blow a

train from the track. The weather is beyond the control of IR although the desire to keep the trains running may sometimes be injudicious, especially where the capacity to monitor track and bridge conditions is not as good as it should be.

A few accidents have been caused by sabotage or other malicious acts. Sabotage, a form of criminal behavior, raises the other aspect of railroad safety as experienced or perceived by passengers and shippers: crime of various sorts. Actually, the most frequent crime perpetrated on the railroads is carried out by passengers in the form of ticketless travel. This problem, which reared its head in an acute form during the nationalist struggles of the 1920s and 1930s and against which Gandhi inveighed in 1947, has continued to bedevil IR since 1947. In 1994–1995 almost 6 million cases were detected—and they were just the ones who were caught. The loss to IR passenger revenue may be in the 4–5 percent range but no one knows for sure: the exact dimensions of the problem are unknown and for every person caught a larger number are not caught. The numbers continue to mount despite strenuous enforcement efforts. The latter included the introduction, in 2000 on the Mumbai suburban lines, of squads of female ticket checkers and their accompanying female police. Women, apparently, are modest but not adverse to free travel. A problem related to ticketless travel is the high levels of emergency-cord pulling, usually by those without tickets seeking a hasty exit from the train. Pull the cord, the train stops, and the miscreant gets off. Also, other trains are affected since their schedules are negatively affected by the stopped train.

Other crimes affecting the railroads are vandalism, thefts, and pilferages. Rao, a senior railroad official, stated that "thefts and pilferages of goods and parcels occur on a large scale" with the perpetrators often using clever methods such as forged receipts or the diversion of wagons by the replacement of their labels.[11] A wagon cannot easily be diverted without insider help so we find IR employees engaged in theft, as do outsiders, with both frequently acting in collusion with one another. Eight thousand eight hundred and eighty-nine people were arrested for the damage or theft of railroad material and fittings and 1,451 for crimes involving booked consignments in 2004–2005, but, as in ticketless travel, one suspects more escape detection than are caught.

Occasionally, armed groups will stop a train, usually a freight train, and loot it. These kinds of incidences are few and most likely to occur during periods of civil disturbance and/or in areas where insurgent activity against the state or national government is present. Westwood describes the effects of social dislocation in the late 1960s and early 1970s on rail travel in eastern India.[12] One example was a riot by over 100 students when one of their number was found to be traveling without a ticket: they attacked railroad personnel, damaged railroad offices and, with the help of sympathizers, subsequently delayed rail services for over 12 hours. Westwood also mentions

a train near Calcutta in June 1969 held up by some 200 armed men who were seeking the widely despised smugglers of rice—not robbery but rather vigilante justice!

The drive to control criminal activity has resulted in IR getting into the police business in a big way. Two police forces provide protection to the railroads, their passengers, and their freight. The Government Railway Police are under the control of state governments although half-funded by IR. Because of state-level control their efficiency varies from state to state. More formidable is the Railway Protection Force (RPF), headed by a director general within the Railway Board and with a chief security officer holding the rank of an inspector general of police in each zonal administration. Started in 1957 RPF had 54,882 members on March 31, 2002. Armed, it is tasked with protecting railroad property and booked consignments. Shoot-outs with criminals do occur. One criminal and two RPF constables were killed in 2004–2005 but previous years have seen higher tolls.

The other common form of crime is corruption on the part of IR employees and those who bribe them to gain advantage. It exists at most levels within IR and ranges from the petty bribe of some tens of rupees to gain a better seat on a train or the expedited movement of a parcel to major instances where, for example, large contracts or other major considerations may be at stake and where substantial sums change hands. Khosla, author and former senior IR official, is blunt: "While ticketless travel hurts the honest fare-paying passenger, corruption among railway staff has wide ramifications and affects almost every facet of railway working."[13]

As this book has shown corrupt practices have been a part of Indian railroading since its inception. Corruption is not something that began after India became independent nor is it something from which the post-1947 authorities have shied away. Its presence is recognized—as in Khosla's statement above or in the presence of enquiries into corrupt practices, among which the Railway Corruption Enquiry Committee, 1953–1955, composed of members of Parliament and a few others, is the best known. However, it should also be said that IR consigns its discussion of corrupt practices in its annual report and annual yearbook to a section euphemistically headed "Vigilance." Even so, there is little doubt that corruption is the main concern of the "Vigilance Directorate of the Railway Board." Bill Aitkens has a more jaundiced view. He writes: "Those amused by the righteous postures the government takes up when it hasn't the slightest intention of doing anything serious will enjoy the 'Vigilance' statistics that in recent years have resorted to the nasty method of using decoys to trap corrupt railway personnel."[14]

The *Report* of the Railway Corruption Enquiry Committee addressed the question of why railroad corruption in particular should be the subject of investigation. The answer was that, yes, corruption existed elsewhere and that a broader attack on the problem should be part of the solution to

railroad corruption. However, the railroads were India's largest nationalized undertaking and India's biggest utility.

> Its operations must therefore be judged by these two considerations. No industrial concern caring for its customers and its reputation can allow widespread corruption among its employees. Moreover, our transport system has direct, constant and widespread impact on the general public. In a Welfare State, the work of such a nationalised utility concern, the efficiency with which it is operated, the services that it renders to customers and its contribution to the national production have a special significance. It provides a test of the capacity of the administrative machinery to undertake the responsibility of running nationalised industry.

These sentences, found ironically within a report on corruption, provide support for the emphasis, before and after 1947, found in this book on the immense, generalized impacts the railroads have had on the making of modern India.[15] The same sentences also provide measures against which the performance of IR since 1947 can be assessed: efficiency, service, and contribution to national production.

Freight, Road Transportation, and the National Economy

For all of the attention its passenger traffic justly receives, IR is also a major transporter of freight. Here, too, one finds many innovations since 1947. The changes have been of two sorts: (1) new, larger capacity equipment usually able to travel at higher speeds and (2) improved logistical practices and more rational and more equitable pricing policies (e.g., a new freight rate structure). Recently, freight Rajdhanis analogous to the passenger express trains, have been introduced.

Equipment changes could be the subject of a detailed, technical account of a long series of new and/or improved pieces of freight-carrying units: special hopper cars designed for mechanical loading and unloading, refrigerated units for perishable foods, better and safer tanker wagons for the petrochemical industry, giant units with adjustable frames and better shock absorbers to transport the machinery needed for hydroelectric plants, factories, and so on, to improvements to the general-purpose wagons that carry much of the daily freight. These new wagons, moreover, have been equipped with better buffers and couplings and improved braking (the vacuum brake has given way to the air brake).

Fortunately for IR, few freight consignments are as individually heavy or require such special handling as the 130-ton granite statue of the Hindu deity Lord Hanuman transported from Mangalore—where 3 years had

been needed to carve it—to Delhi during one month of slow, careful transportation.[16]

Intermodal innovations existing at the junction of improved equipment and new logistical practices have improved the interfaces between sea, rail, and road transportation. In the words of *Indian Railways Annual Report and Accounts 2001–2002*, p. 67, "1,1905 high speed state-of-the-art rail flat cars with built-in anti-pilferage devices for container transportation have been purchased and inducted on various streams resulting in improved transit time." The Konkan Railway has roll-on/roll-off flat cars. A driver maneuvers his truck on to a flat car and drives it off at the destination (a procedure like that used by truckers "crossing" the English Channel via the Chunnel) avoiding a slow, tortuous drive along the coastal highway.

Containerization has become a major tool of IR in its competitive struggle with road transport. The transportation of bulk commodities is clearly the preserve of the railroads but in the transport of non-bulk items—including what are essentially parcels—trucks with their greater flexibility, doorstep pickup to precise delivery, and quickly adjustable rates have a competitive edge. Among IR's responses has been the development of sealed, 5-ton containers moved by road and rail from the consigner's warehouse or factory to the consignee's address with the rail portion of the trip carried on special high-speed BLCA wagons (low platform container flat wagons). Since 1996 IR's efforts in the field of containerized transportation has been conducted by its specially-tasked subsidiary, the Container Corporation of India, Ltd. (CONCOR since India is an alphabet soup of acronyms). These intermodal innovations suggest the presence of some interdependencies and synergies as India moves toward a better integrated, more encompassing national transport policy. Nonetheless, if IR is to have a "truly modern railway system" able to meet and adapt to the "full frontal assault from road transport" then the GOI must fund the railways appropriately.[17]

Improvements in the freight equipment must be put into the context of the more powerful locomotives described in the section below. More tractive power has made longer, heavier, faster freight trains possible and hence the efficiency of freight transport has increased. For example, coupled, multiple diesel, or electric units can pull a half-mile long rake of heavily loaded, ore hopper cars. Better wagons and stronger locomotives have enabled IR to increase its freight loads.

Logistical practice encompasses all of the rules and procedures relating to what can be shipped, how, in what and in what quantities, by whom and from where to whom and to where, prices charged (with, quite naturally, faster shipment and/or special handling commanding a premium). These are enormously complex dimensions of the business of freight transportation. The rules and procedures are rarely fixed for long because IR must adjust to changing conditions, competition from other methods of freight transportation, particularly road transportation, the changing characteristics of

that which must be transported, and political pressures to favor certain commodities, industries, locales or developmental or social objectives.[18]

Many of these complexities are reflected in the freight rate structure. Here one finds in the post 1947 era a major simplification and rationalization of the railroad freight rates and an ongoing process of adjustment to current realities. The presence of multiple railroad administrations in colonial India had resulted in a complex system of rates whose only uniformity was the maximum chargeable (although temporary surcharges did occur) for the transportation of particular classes of commodities as adopted by the members of the Indian Railway Conference Association (to which most, but not all, the railroads belonged) from 1910 onward.

Within the operating ambit of any particular railroad administration longer transits did result in proportionately lower charges but only within that jurisdiction. Of course, no railroad in the colonial period operated throughout India. Thus, where movement of goods crossed more than one jurisdiction the advantage of the telescopic rate was lost. In the colonial period, too, rate competition between the administrations (the Conference rates, remember, were maxima only) sometimes had results counterproductive to the financial health of the lines. Moreover, special rates for shipment to and from the great ports, the hinterland-port-hinterland nexus mentioned in earlier chapters, encouraged the import of manufactured goods and the export of raw materials—the classic economic relationship of colonialism with its concomitant discouragement of industrial manufacturing in India.

Discussion about these issues had been underway in the 1930s but nothing major was done to change things until independence. Then, there was a major change, proving that in some areas the colonial legacy could be quickly set aside. The creation of a national railroad system under a single administration provided the unification necessary to have a uniform schedule of rates across India. A specially commissioned body quickly studied the rate question, made its recommendations, and a new, uniform rate structure was instituted on October 1, 1948. Competition ended, freight had to be routed along the shortest line, and the greater the distance carried the lower the rate charged within a structure of 15 class rates (e.g., at one time a rate of Rs. 42.20 per ton within a certain class for 100 km, i.e., 62 miles became Rs. 21.92 for 2,500 km, 1,550 miles). Preferential pricing for import-export traffic was specifically forbidden.

Defects and inadequacies in the 1948 rate structure were rectified in 1958 and, later, the Rail Tariff Enquiry Committee (1977–1980) struck by Parliament made extensive recommendations for further simplification, rationalization, and improved user convenience. These and yet other changes recommended later continued to be implemented through the 1990s. Aggrieved shippers have been able to take their complaints about the application of the freight rates and other freight matters to the independent Railway Rates Tribunal or to the Railway Claims Tribunal, whose chair must always be a

sitting or retired judge of the Supreme Court or a High Court, and whose decisions are binding on all parties to a dispute. One can generally say, in fact, that since 1947 a variety of mechanisms have been put in place to improve the rights of shippers and passengers and to make their voices and complaints heard better. Complaint books, claims tribunals, and railway users' consultative committees (national, zonal, and divisional) are some of these mechanisms.

Other aspects of logistical practice can be found in IR's responsive manipulation of the conditions under which a commodity is accepted for shipping. These include incentives to induce more use of train load movement rather than piecemeal wagon loads in the transport of some bulk commodities (although a variation of this is over 100 combinations of two point rakes for shipments where a full train load is not forthcoming), discounts to attract new traffic, and simplified rules regarding the construction and maintenance of sidings by IR customers. The computerized, on-line Freight Operations Information System (FOIS) can provide shippers with information about the status of their in-transit goods.

Bill Aitken, an engaging if sometimes acerbic observer of India's post-1947 railroads writes: "The subject of goods trains, despite the fact that they yield 75 per cent of the revenues of Indian Railways, rarely stirs the public imagination." "The movement of freight like the motion of the bowels is better imagined than investigated."[19] The brief gloss above, hopefully, is sufficient to identify the importance of freight to the operations of IR, and to reveal some of its complexities. Perhaps one statistic captures the magnitude of what has happened over the past 50 or so years. IR transported 73 million tons of revenue earning freight in 1950–1951; the comparable figure for 2004–2005 was 602.1 million tons—an increase of 725 percent.

The Changing Engines of Change: National Self-Sufficiency and Technological Advance

The engines of change themselves changed in responsive adaptations to the new realities of independent India. A highly visible manifestation of those changes was to be seen in the locomotives. Powerful diesel and electric units (each generation gets more powerful) replaced steam locomotives in a major shift largely accomplished by the end of the 1970s.[20] The engines—the locomotives, the prime movers of any railroad system—were potent physical instruments and powerful symbols of that entire ensemble of machines, people, and institutions we capture in the single word, railroad. Diesel locomotives were put into greater use by IR in 1958, and electric locomotives (used in India since the 1920s) were manufactured increasingly in India (as had been steam locomotives through the 1950s and 1960s), and from an

Figure 8.1
Steam Locomotives. *Source*: Photograph Taken by the Author at the National Rail Museum, Delhi, India.



ever-higher percentage of made-in-India components. At the beginning of the 21st century, most Indian locomotives and other rolling stock are India-made although IR is not adverse to accepting technological innovations from elsewhere via licensing arrangements or other mechanisms—or purchasing carriages or locomotives with an arrangement subsequently to manufacture the same in India.

Figures 8.1 and 8.2 provide a striking visual expression of the changes in locomotives. Figure 8.1 juxtaposes an older, smaller steam locomotive with one of the behemoths that provided main-line steam locomotion in the 20th century. Figure 8.2 shows examples of the powerful diesel and electric locomotives one encounters in early 21st century India.

The shift to Indian production broke with the colonial past when, as we saw in earlier chapters, much railroad equipment was purchased from Britain and other Western countries. The political and economic realities of independent India stressed the need to be self-sufficient where possible and to engage in import substitution to conserve limited reserves of foreign exchange.

One result of the made-in-India policy was the construction of major, new workshops where locomotives, other rolling stock, and major components for both could be manufactured and assembled. The Chittaranjan Locomotive Works (symbolic of the new order the facility was named after a famous Indian patriot, Deshbandhu Chittaranjan Das) located in the

Figure 8.2
Diesel and Electric Locomotives. *Source*: IRFCA (Indian Railways Fan Club), Online Photo Gallery, http://www.irfca.org/gallery/Locos/Mixed/IMG_0426_1_1_1.JPG.html.



coal belt of West Bengal began production of steam locomotives in January 1950. The last of these was produced in February 1972 when production at Chittaranjan had already moved extensively into electric locomotives. Spreading over 90 hectares of land and containing many specialized units such as a galvanizing plant, a steel foundry, and a traction motor shop, this huge industrial complex employed some 17,500 people in the mid-1990s.

Chittaranjan was situated in a once rural area, so a town of considerable size had to be built to accommodate the workers and their families. The town is one of the many "railway colonies" that dot the Indian landscape within which railway employees and their families live in IR-provided housing, receive IR-provided medical care, participate in IR-sponsored recreation within IR-owned buildings. The railroad colonies have their roots deep in the colonial period but today their occupants are Indians rather than Britons. Chittaranjan, like the much older workshop complex at Jamalpur in Bihar, involved the development of a modern, industrial enterprise and its accompanying colony in a previously little populated area.

IR's production unit in West Bengal was followed by other, large facilities elsewhere in India. The giant Integral Coach Factory located in the Madras suburb of Perambur opened in 1955. It is the largest coach-building factory in Asia. It employed over 15,000 in the mid-1990s. The demand for coaches resulted in the opening of the Rail Coach Factory situated at Kapurthala in the Punjab. It produced its first vehicle in 1988. Similarly, the Diesel Locomotive Works was opened in a suburb of Benares in 1961. The Rail Wheel Factory began production at Yelahanka near Bangalore in South India in 1984, and, in the late 1980s, the Diesel Maintenance Works opened at Patiala in the Punjab. The major production facilities exist as separate administrative entities headed by senior officers within IR's elaborate hierarchy.

Interestingly, most of the goods wagons used by IR are manufactured by private and public sector firms to IR specifications. Thus, IR demand for this kind of equipment has provided a stimulus to various enterprises, among which some of the larger concerns have developed export capabilities. It is difficult to overestimate the extent to which the needs and operations of IR ramify throughout India's national economy.

The opening of the facilities mentioned above coupled with the systematic modernization (a never-ending process) of the machine tool technology in the existing workshops speeded up the production, repair, and maintenance of railroad operating equipment. India became largely self-sufficient where the needs of IR were concerned. Workshop modernization proceeded according to evolving plans drawn up by a central coordinating body, the Central Organisation for Modernisation of Workshops, established in 1979 and headed by an official with the rank of General Manager. That body now concentrates on the procurement of plant and machinery for the railroads.

Mention also should be made of the Research, Designs and Standards Organisation (RDSO) located in Lucknow. Evolving from a small Central Standards Office started in 1930 the RDSO (specifically dating from 1957 when various research functions were merged within one unit) has become one of the world's leading centers for research into all aspects of railroad construction, operation, and maintenance. The RDSO campus at Lucknow extends over 165 hectares and contains 68 service buildings, laboratories, a high-speed test track, etc. The RDSO is the technical advisor and consultant to IR, to other bodies in India's public and private sectors, and to foreign clients.

Indeed, in a dramatic reversal of the dependence during the colonial period on foreign equipment and foreign experts India has become an exporter of railroad equipment and technical and managerial expertise. Equipment has been sold to railroads in Asia and Africa. Rail India Technical and Economic Services Ltd (RITES), a separate, public sector organization under the administrative control of the Ministry of Railways, was established in 1974 to draw upon the vast pool of experts within IR in order to provide consultancy

services across the entire range of railway technologies and administrative needs, from accounting to telecommunication engineering. RITES has taken on projects throughout the vast area extending from the Philippines to West Africa and has been so successful as to become a net earner of foreign exchange for the GOI. IRCON (Indian Railway Construction Company), another public sector organization under the Railway Ministry, takes on railroad and other construction projects throughout India and the world.

Defending the Nation

India's emergence as an independent nation-state was accompanied by a great deal of internal violence and unresolved issues along its borders. The partitioning of 1947, discussed in the previous chapter, left a huge legacy of distrust, hatred, and unresolved issues (especially but not solely the question of Kashmir) that poisoned relations between Pakistan and India through the remainder of the 20th century. Wary coexistence in the better times gave way more than once to outright hostility. Three Indo–Pakistan wars, an almost continuous insurgency in Kashmir, numerous border incidents, and moments of nuclear sabre-rattling (Indian and Pakistan both developed the capacity to deliver missiles with nuclear payloads) have punctuated post-1947 South Asian history. India also had a border war with China and, for a time, maintained a military presence in the Tamil area of Sri Lanka.

Strikingly, railroad travel has played an important role in the "confidence building measures" recently instituted to improve relations between India and Pakistan. If cross-border trains in 1947 were often scenes of horror the recent resumption of direct train travel between Amritsar and Lahore (suspended for many years) is a hopeful development.

The railroads have made important contributions to India's national security. In most dimensions these are similar to the benefits the railroads provided to the colonial state: (1) the capacity to garrison troops, paramilitary forces, and police at select points within India and then move them rapidly to trouble spots via the railroads, and (2) to move troops and their equipment to India's land borders and to continue to supply them for as long as necessary. The railroads were busy during the wars with Pakistan. Railroad staff near the frontiers faced shelling and bombing and some lost their lives.

Particularly striking in this regard was IR's rapid construction of two new lines in the immediate post-1947 period. These two lines, both built through demanding terrain within a short period of time, were designed to deal with the fact that the line of Partition had cut the bulk of India off from easy communication with Indian territory in the northwest and in the northeast.

In the northwest Partition had severed Indian Kashmir from its previous railheads—from whence road transport took up the journey—at

Rawalpindi and Jammu. Rail connections previously routed through Lahore now required improved connection with Delhi. Thus, construction of the Mukerian–Pathankot line began in November 1949, and the formal opening occurred in April 1952. The line was 27 miles long but reduced the distance between Delhi and Pathankot by 44 miles. Extensive and heavy bridge work was required. Pathankot, however, was still a considerable distance from Jammu. Three and a half miles of line beyond Pathankot to Kathua were opened in 1966 but Jammu was still 48 miles further on. Work on the additional distance began in 1969 and, though a demanding piece of construction and slowed by the Indo–Pakistan War of 1971, it was opened to goods traffic in October and passenger traffic in December of 1972. Subsequent work has seen a line pushed beyond Jammu to Srinagar and beyond in order to strengthen Indian control over Kashmir.

In the northeast Partition had severed the rail lines of Assam from India so a new line through Indian territory had to be built as a matter of urgent national priority. This was the 143-mile Assam Rail Link whose construction began in January 1948. The line opened in January 1950: a two-year saga that gave the project and its engineer-in-chief, Karnail Singh (later to be a Chairman of the Railway Board), an almost legendary status. From the surveys to the construction, to the ongoing maintenance the Assam Link has presented a formidable challenge. Built through a land of malarial jungles, steep terrain, few people, and an annual rainfall exceeding 250 inches, the line cuts across the drainage of the Himalayan and sub-Himalayan ranges. The line, therefore, required heavy bridging across what are sometimes very large rivers (22 rivers required deep foundation wells), much difficult earthwork, and the use of a 15,000 person workforce brought in from elsewhere.

A good deal of construction activity also took place in western Rajasthan and in Saurashtra. The latter included the 145-mile Jhund–Kandla (Kandla was subsequently renamed Gandhidham) line, a section of which crosses the quicksands of the little Rann of Kutch, built to enable the greater use of Kandla as a port for the export of commodities from the Punjab and Rajasthan, and to provide India with more transportation capacity in an area of strategic importance. The overuse of Bombay (and the railroad lines that fed its port) caused by the loss to Pakistan of the port at Karachi gave urgent impetus to the project.

Construction of the 106 km (66 miles) line from Pokaran to Jaisalmer in the desert of western Rajasthan was authorized in August 1966, in the aftermath of the Indo–Pakistan War of 1965. Built quickly and opened to traffic in August 1967, it was a line often contemplated but never undertaken until the troubles with Pakistan highlighted its strategic importance. Jaisalmer is the only Indian city (an ancient city) close to the border in that part of the subcontinent where a portion of India thrusts close to the Indus River and the Pakistan city of Sukkur with its bridge and major irrigation works.

Many other lines have been built since 1947 including the magnificent Konkan line discussed in Chapter 3. Some of the lines contributed directly to defense needs. All of them contributed to better national integration and to enhanced security. They represented a growing break with the port-hinterland pattern of lines inherited from the colonial past.

Mention was made in a previous chapter of the Railway Volunteers—those part-time soldiers enlisted entirely from the ranks of European and Eurasian railroad personnel who helped to buttress the colonial state. They, of course, disappeared with the coming of independence but a new auxiliary force, the Railway Territorial Army, was formed in 1949. Renamed the Railway Engineers Regiments in 1975, they consist of serving railroad personnel plus a small nucleus drawn from the regular Army. They have yearly training camps like their Volunteer predecessors and are tasked with the job of maintaining rail communication in forward areas during hostilities and ensuring the continuation of essential rail services during peacetime emergencies. However, in the early 1970s, and particularly in the great railroad strike of 1974, the railroad personnel serving in the Territorial Army were mobilized and used to drive trains, operate signals, and to fill other technical jobs. In effect, the members of Railway Territorial Army were used as strikebreakers.

The Men and Women of IR: Numbers, Changes, and Management–Employee Relations in Independent India

Mention of strikes brings us to the human dimension of India's railroads in the postindependence period. The railroads had 1,033,217 permanent employees in 1947, of whom 1,345 were Europeans (British) and 12,281 were Anglo-Indians (Eurasians). Additionally, a substantial although never precisely enumerated number of people found casual employment through the railroads and their contractors. Very few of the British stayed on after independence—the speed and effectiveness with which Indians took over the senior positions was a telling repudiation of the colonial practice of keeping the senior posts largely for the British. Anglo-Indians ceased to be counted as a separate category although we know from other evidence that many of that community, beleaguered and anomic as they often felt themselves to be, remained in railroad service. Thus, simply but tellingly, one the greatest changes post-1947 was the complete Indianization of the railroad workforce in full realization of a long-standing nationalist demand.

In March of 2005 IR had 1,422,200 permanent employees, to which one can add many casual workers. Thus in the early 21st century, many Indians find employment via the railroads, and many families are directly supported by income derived from railroad-related work. The significance of these numbers cannot be overemphasized. They indicate how

deeply entrenched the railroads are into the lives of a great many Indians. Moreover, since the permanent employees often get railroad-provided housing, medical care, education, further training, subsidized canteens, holiday homes, and recreational facilities, the colonial pattern of a workforce whose existence was shaped to a considerable extent by their employment and their employer continues. The main difference between the colonial past and today is that Indians run the whole show and Indian workers have a wider range of benefits than in the past.

The 1,422,200 employees in 2005 do not represent the maximum size attained by IR. The number peaked at roughly 1.7 million in the early 1990s, from which peak there has been a small but deliberate draw down. A criticism of IR from within its senior ranks, and from without, is that IR is overstaffed. Measures of staff performance such as net tons carried per staff or net ton kilometers per staff indicate IR compares poorly with most of the world's railroad systems. One insider, then general manager of RITES, said in an analysis published in 1991 that "Indian Railways have to reduce the number of staff."[21]

The railroad workforce remains enormously complicated and divided by multiple divisions of rank and occupation. The big divide in terms of the vertical hierarchy is between the officer cadre—those holding what are known as "gazetted" appointments—and the rest. The gazetted cadre, group A, numbered 7,664 in 2002 and they, along with group B (noncommissioned officers to use a military term) totaled 14,300 in 2002, or just under 1 percent of the total number of IR employees. Gazetted officers are recruited via competitive examination into the eleven managerial services, namely six services of engineers (e.g., the civil engineers in the Indian Railway Service of Engineers, and the Indian Railway Service of Mechanical Engineers), four other services ranging from Indian Railway Traffic Services to the Railway Protection Force, and an eleventh service, the Indian Railway Medical Services cadre.

The much larger C and D staff groups are divided among over 700 different occupational and other categories. C positions are hired through the nineteen Railway Recruitment Boards (RRBs), and the D positions through the RRBs, and by ad hoc mechanisms at the divisional and workshop levels. Recruitment must conform to the various affirmative action policies of the GOI designed to ensure the hiring of members of scheduled castes and scheduled tribes. As the largest single employer in India and as a state-owned and operated enterprise the expectation is IR will treat its employees well—and, for the main part, it does so. A permanent job with IR is not to be spurned. One zonal administration recently had 2 million applicants for 8,000 positions. A place in the officer cadres, selected via highly competitive examinations, offers the prospect of advancement to demanding and interesting positions with command over substantial human and material resources.

Nonetheless, and despite the generally decent wages and acceptable working conditions IR employees receive, the relationships between IR's management and its workers have not always been harmonious in the postcolonial era. The "racial" irritants of the colonial period are gone but the tensions between those who labor and those who command their labor remain. An additional complication has been the sometimes-close relationships between particular political parties and the two national federations of railroad unions (All India Railwaymen's Federation, AIRF, and the National Federation of Indian Railwaymen, NFIR) who, along with one union affiliated with each federation within each zone and within the major production units, form the bodies recognized as unions for the purpose of negotiation, grievance procedures, etc., with IR. Those holding officer rank in IR also belong to a quasi-union in the form of their Federation of Railway Officers' Associations and the Indian Railways Promotee Officers' Federation.

Strikes by railroad workers, therefore, sometimes have had political coloration insofar as they became associated with trials of strength between the governing party of the day and the opposition parties. The potential of a rail strike to adversely affect the functioning of a region of India, or India itself in the case of a general strike, make the railroad workers potentially potent weapons in political disputes. However, that the potential is only rarely realized regardless of whether the workers, in any particular instance, have their own significant discontents or not. The complexity of IR, its multiple grades and many occupations, complex hierarchies, and zonal and divisional structures make the large-scale combination of workers difficult.

The management of IR, like the management of most large corporations where formal unions represent the workers, seeks to channel and weaken the ability of its employees to act collectively. Elaborate consultative mechanisms involving management and the recognized unions have been put into place to deal with worker discontents and grievances. Thus, IR's recognition of a limited number of unions is one device for containing and channeling worker protest. Management deplores the proliferation of unions (an attitude shared by the leaders of the recognized unions) since it prefers the certainty, continuity, and deal-making known unions and their leaders provide. However, the workers, particularly when deeply discontented, accept the leadership of unrecognized unions because they consider the leaders of the recognized unions too close to management and out-of-touch with the rank and file union membership. Unrecognized unions proliferate in troubled times and wildcat strikes are not unknown—strikes whose particular trigger may be a very local incident or grievance, but which sometimes tap wider veins of discontent.

One strike in Bihar began on February 3, 1971, when station masters, cabinmen (signal cabins) and switchmen spontaneously quit work after the wife of a cabinman was assaulted by a soldier in the Railway Protection Force (RPF). Before it ended on February 10 after the IR management took

action against the offending RTF personnel and also promised no disciplinary action against the strikers, some 20,000 employees of Eastern Railway had become involved and traffic service through the Eastern and neighboring zones had been severely affected.[22]

Given the size and complexity of the IR workforce one can say, that, on the whole, industrial relations within independent India's railroad industry have been reasonably but not entirely calm since the later 1970s. This followed a period of much greater turbulence through the 1960s and early 1970s. In 2001–2002 the official Railway Board view was that industrial relations "remained very cordial."[23]

A reason for the calmer situation in recent decades may be the great general strike of railway workers that wracked India in May 1974: a strike from which all sides (including, crucially, the GOI which is not a passive bystander in many events involving the railroads) learned some lessons and which itself—the strike and its forceful repression—had consequences for the subsequent political evolution of India.

A factor in the 1974 strike was a growing feeling among union members that they were represented poorly by the recognized unions. Thus, independent unions grew in number and strength and, notably, launched three major strikes against Southern Railway in 1967, 1968, and 1970. A full analysis of the 1974 strike could take up an entire book—as indeed it does in Sherlock's *The Indian Railways Strike of 1974*. In a nutshell, worker discontent reached new heights in 1973–1974 when inflationary pressures severely affected the buying power of a worker's wage packet. Unity among the railroad workers was slowly forged and the AIRF led by George Fernandes, hitherto a labor leader in western India with a reputation for militancy, managed to position itself (clearly the initial impetus for the strike came from the independent unions) as the leading organization among the striking groups. The systemwide strike began on May 2, 1974, massive numbers of workers actively joined in, and many more stayed off work. Rail services were thoroughly disrupted. The Government of the day, the Congress Party Government of Prime Minister Indira Gandhi, and the Railway Board had decided to deal firmly with the threat to strike and then with the strike itself. Union leaders were arrested, police action against striking workers followed, the Territorial Army was used to keep trains running, and on May 28 the strikers unconditionally surrendered and went back to work—or to dismissal for many.

More than one analyst considers the successful repression of the 1974 strike to have emboldened the Indira Gandhi Government to take the draconian step of imposing Emergency Rule on India in 1975, when many of the standard rights and liberties present in the Indian Constitution were suspended.[24] When the Emergency was lifted in 1977 and free elections took place, Indira Gandhi's Party was defeated and the Janata Government took

over. Ironically, the Minister of Railways in that Janata Government was a newly elected member of Parliament called George Fernandes!

Few events in the history of post-1947 India better highlight the intricate and important ways in which the railroads are an integral part of the total fabric of Indian national life. No dimension of modern India—political, social, cultural—is unaffected by the railroads and their workers.

1947–2005

Leaving aside the Partition-ravaged years immediately after independence and beginning the comparison with the 1950–1951 operating year, we can look at Table 8.1 to see how, according to a few key indicators, the railroads of India developed over more than a half-century from 1951 to 2005. The picture that emerges is one of great change—change explored in the text above—and substantial growth. A railroad system in 1950–1951, still suffering from the human and physical disruptions of 1947–1948, and not fully recovered from the depletions of World War II, had, by 2005, been rebuilt,

Table 8.1
Selected Railroad Statistics, 1950–1951 to 2004–2005

Measure	1950–51	1980–81	2000–01	2004–05
Route kilometers	53,596	61,240	63,028	63,465
Track kilometers	83,706	104,480	108,706	108,805
Track kilometers electrified	1,253	13,448	36,950	43,364
Revenue freight carried in tonnes[a]	73.2	195.9	473.5	602.10
Avg. train load, broad gauge, tonnes	489	884	1,233	1,490
Passengers carried, suburban[a]	412	2,000	2,861	3,178
Passengers carried, nonsuburban[a]	872	1,613	1,972	2,126
Passengers carried, grand total[a]	1,284	3,613	4,833	5,378
Staff (permanent IR employees)	91,360	1,572,200	1,545,300	1,422,200

[a]In millions.

changed, and developed beyond all expectations current in the mid-20th century.

At the beginning of the 21st century the engines of change moved across India in greater numbers than ever before: over 9,500 passenger trains and a great many freight trains every day. In 2004–2005 they were, moreover, pulled by one of the 4,801 diesel locomotives or 3,065 electric locomotives that provided the tractive power of the modern IR, thus highlighting another great change in the postcolonial era: the withdrawal from regular service of the steam locomotives whose great plumes of steam and distinctive noises dominated Indian railroading from 1853 until the 1980s. Steamers numbered 8,120 in 1950–1951 while the fifty or so that remain today are restricted to special heritage trains and a few hill lines.

Freight and passenger traffic are both up sharply as IR makes good its claim to provide the nation's lifelines. Interesting, too, is the great increase in suburban (commuter) passenger traffic. Here one finds illustration of the chicken and egg conundrum: which comes first? The growth of suburban traffic reflects the explosive growth of India's cities in the post-1947 years. However, it was a growth made possible, at least in part, by the ability of IR to increase its capacity to transport passengers on a daily basis to and from work. Mumbai is the preeminent example but it happened in other cities as well. Staff numbers came close to doubling in the postcolonial decades but the numbers peaked and even declined a little through the 1990s and beyond, thus suggesting a somewhat leaner and more efficient IR.

Conclusion: 150 Years and Counting

India's railroad history from 1947 to 2001 contains much of interest and of significance for the ways in which that enormously large country—large physically, larger demographically, and with a cultural complexity to match size and population—has developed and changed as an independent nation-state. However, the entire era of railroading in India, an era now over 150 years long that stretches from the beginning of construction in 1850 to the opening of sections of an ultramodern, underground railroad in Delhi in 2004, provides us with the wider story, the fascinating story, of the making of modern India itself. It was a making in which the railroads, their employees, their passengers and freight shippers, and many others including colonial administrators and nationalist politicians, played a central role. No railroads, no India? Perhaps—or at least a very different India. One cannot deny Jean Deloche's observation that steam locomotion instituted a transportation revolution in the Indian subcontinent. And because of that transportation revolution, much else changed. Time and space became coordinated in new, intense ways, the colonial state grew stronger, and, lo and

behold, helped to evoke the Indian response of nationalism and the desire for national independence.

At the center of many of these changes one often found the railroad—that large-scale technical system that linked and enabled so much else from emergent national markets for food grains to a phase of the national movement or to new cultural uniformities and diversities. Gandhi saw how the railroads helped the British to control India, he decried the dehumanizing aspects of railroad technology, and the more specifically degrading aspects of third-class rail travel for Indians, yet he, Mahatma Gandhi, father of the Indian nation, rode the trains—often—in the service of the national cause.

Ironically, another Gandhi, Prime Minister Indira Gandhi, the daughter of India's first and greatest prime minister, Jawaharlal Nehru, saw a national rail strike in 1974 as a threat to her government, and used heavy-handed measures to end the strike. The railroads in 1974, as they had been throughout their existence, had come to be seen as crucial to the maintenance of state power by those in power. Some attitudes did not change in 1947.

This book has tried to explore facets of this 150-year-long story. Much remains unexplored; much could be explored in greater depth but the intent here has been to introduce readers to some of the delights and complexities of India's railroad past. Perhaps this book has something in common with the passengers aboard the inaugural train of the Great Indian Peninsula Railway when it traveled from Bombay to Thana and back to Bombay in April 1853. All understood they were participants in an event that marked an important new development—and a break with the past—in India's history. Some had inklings of what steam locomotion—engines of change running on iron tracks—might mean for India's future. None could foresee the many ways that railroads did in fact change and make India. Even with the advantage of hindsight, this book has only touched on some of the ways that future unfolded. There is much more that could be explored and described. Perhaps some readers will be encouraged to take up train travel in India since, arguably, one must do that to fully grasp the hold the railroads have on India. As Paul Theroux memorably wrote: "The railway possessed India and made her hugeness graspable."[25] Train travel in India can be frustrating and, at times, tiring or uncomfortable, but it is always fascinating and worthwhile.

As to the future of India's railroads—the rest of the first decade of the 21st century and beyond—we can only be sure of one thing. Railroads will be an important part of India into the foreseeable future. However, the railroads never will be a static presence, physically, technically, institutionally, or in terms of their personnel. As in the past, the railroads will keep changing and adapting to the Indian world they both make and which makes them. The engines of change have many more miles to travel.

Notes

Chapter 1: Introduction

1. "Foreword" to G. S. Khosla, *A History of Indian Railways* (New Delhi: Government of India, Ministry of Railways [Railway Board], 1988), p. vi.

2. Quoted in S. R. Mehrotra, *The Emergence of the Indian National Congress* (Delhi: Vikas Publications, 1971), p. 112. Rao's three states were important examples of the 500-plus Indian principalities mentioned earlier.

3. Stuart Cary Welch, *Room for Wonder: Indian Painting during the British Period 1760–1880* (New York: The American Federation of Arts, 1978), pp. 137 and 139, reproduces Rajasthani paintings created in the 1870s that depict locomotives and rolling stock.

4. Jean Deloche, *Transport and Communications in India Prior to Steam Locomotion, Vol. I*: *Land Transport* (translated from French by James Walker) (Delhi: Oxford University Press, 1993), p. 1.

5. John Hurd, "Railways," in *The Cambridge Economic History of India, Vol. 2*: *Circa 1757—1970*, Dharma Kumar (Ed.) (Cambridge: Cambridge University Press, 1983), p. 741.

6. See Merrit Roe Smith and Leo Marx (Eds.), *Does Technology Drive History: The Dilemma of Technological Determinism* (Cambridge: The MIT Press, 1994) for additional discussion of various approaches to the history of technology. Also see John M. Staudenmaier, "Rationality, Agency, Contingency: Recent Trends in the History of Technology," *Reviews in American History*, 30 (2002), 168–181.

7. G. W. Macgeorge, *Ways and Works in India* (Westminster: Archibald Constable and Company, 1894), p. 221.

8. Anthony Giddens, *The Consequences of Modernity* (Stanford: Stanford University Press, 1990), p. 19.

9. M. K. Gandhi, *Hind Swaraj or Indian Home Rule* (1921; revised new edition, Ahmedabad: Navajivan Press, 1938). The chapter on railroads is reprinted in Ian J. Kerr (Ed.), *Railways in Modern India* (New Delhi: Oxford University Press, 2001), pp. 77–79.

10. David Harvey has explored these developments and their late 20th-century consequences in a number of influential works. See, in particular, *The Condition of Postmodernity: An Enquiry into the Origins of Cultural Change* (Oxford: Blackwell, 1990).

11. I draw on the geographer Robert E. Dodgshon, *Society in Time and Space: A Geographical Perspective on Change* (Cambridge: Cambridge University Press, 1998) for insights into the inertial consequences of spent, spatially imbedded capital.

12. Pakistan in 1947 had two wings, East and West Pakistan, separated by over 1,000 miles of Indian territory. A separatist movement subsequently gathered steam in East Pakistan resulting in the establishment of Bangladesh in 1971.

13. Marx's well-known assessment, "The Future Results of British Rule in India" is reprinted in Kerr (Ed.), *Railways in Modern India*, pp. 62–67.

14. Those interested in commemorative railroad stamps, Indian and otherwise, will enjoy a book by a senior Indian railroad official: S.P.S. Jain, *Railways' Journey Through Postal Stamps* (Mumbai: Central Railway, 2003).

Chapter 2: The Pioneering Decades, ca. 1853 to ca. 1870

1. Quoted in Gyan Prakash, *Another Reason: Science and the Imagination of Modern India* (Princeton: Princeton University Press, paperback edition, 1999), p. 161.

2. Minute by Lord Dalhousie, governor-general of India to the Court of Directors of the East India Company dated April 20, 1853. The entire minute is reprinted in *Railway Construction in India. Select Documents, Vol. II: 1853–1873*, edited by Bhubanes Misra (New Delhi: Northern Book Centre for the Indian Council of Historical Research, 1999), pp. 23–57.

3. Framjee Vicajee, *Political and Social Effects of Railways in India* (London: 1875), p. vi.

4. The discussion of railroad construction draws extensively from Ian J. Kerr, *Building the Railways of the Raj, 1850–1900* (Delhi: Oxford University Press, 1995; paperback edition, 1997).

5. G.S. Khosla, *A History of Indian Railways* (New Delhi: GOI, Ministry of Railways—Railway Board, 1988), p. viii. This is the most comprehensive of the big histories of India's railroads: a thorough if sometimes dull account by a former senior IR official.

6. OIOC, PWD, *Railway Construction Proceedings*, July 1882, no. 115.

7. Kerr, *Building the Railways of the Raj*, pp. 196–226.

8. A. K. Banerji, *Aspects of Indo-British Economic Relations 1858–1898* (Bombay: Oxford University Press, 1982), p. 56.

9. Also see Daniel Thorner, *Investment in Empire, British Railway and Steam Shipping Enterprise in India 1825–1849* (Philadelphia: University of Pennsylvania Press, 1950); and W. J. Macpherson, "Investment in Indian Railways, 1845–1875," *Economic History Review*, 2nd series, VIII(2) (1955), 177–186.

10. Thorner, *Investment in Empire*, p. 168.

11. Ibid., pp. 169–174 provides a useful summary of the main clauses.

12. Ibid., pp. 173–175; Banerji, *Aspects*, p. 54.

13. Such costs formed a substantial percentage of the £42,486 per mile average cost of railway construction in Britain up to 1884. See Philip S. Bagwell, *The Transport Revolution from 1770* (London: B.T. Batsford Ltd., 1974), pp. 99–102. Therefore, the per mile cost in India was not unusually high—at least if one makes an Anglo-Indian comparison. In the United States, on the other hand, construction costs were much lower.

14. The departmental system had functional units, e.g., traffic, civil engineering, and accounts, each with its own head officer under whom were officers in charge of a district. Districts were not necessarily coterminous between the functional departments. A traffic district, for example, did not necessarily coincide with a civil engineering district. Divisional forms of organization did not begin to appear among India's railroads until the 1920s: See Chapter 6.

15. Eurasians were listed as Europeans (British) until counted separately starting in 1873. The 1873 figures are 2,990 Europeans and 2,072 Eurasians in a total workforce of 75,661. See also Table 4.1 in Chapter 4.

16. Hugh Hughes, *Indian Locomotives. Part 1—Broad Gauge, 1851–1940* (Harrow: The Continental Railway Circle, 1990); *Indian Locomotives. Part 2—Metre Gauge, 1872–1940* (Harrow: The Continental Railway Circle, 1992); *Indian Locomotives. Part 3—Narrow Gauge 1863–1940* (Harrow: The Continental Railway Circle, 1994); *Indian Locomotives. Part 4—1941–1990* (Harrow: The Continental Railway Circle, 1996). Hughes provided detailed corroboration for an argument made by Fritz Lehmann in 1965, and captured in the title of his article: "Great Britain and the Supply of Railway Locomotives of India: A Case Study of 'Economic Imperialism'," in the *Indian Economic and Social History Review*, II(4) (October, 1965). Lehmann and Hughes had shared information they both were engaged in collecting. Fritz Lehmann, my friend and a fellow historian of India, died all too young. He was a pioneer in the search for an improved understanding of India's railroad past.

17. Hughes, *Indian Locomotives. Part 1—Broad Gauge*, p. 7.

18. The rest of this chapter depends heavily on Ian J. Kerr, "The Dark Side of the Force: Mistakes, Mismanagement, and Malfeasance in the Early Railways of the British Indian Empire", in Roopa Srinivasan, Manish Tiwari and Sandeep Silas (Eds.), *Our Indian Railway. Themes in India's Railway History* (New Delhi: Foundation Books, 2006), pp. 187–212. Readers are referred to that contribution to find the detailed footnotes to the source materials found primarily in the OIOC record series L/PWD/3/56-66, "Railway Letters and Enclosures from Bengal and India, 1858–1867."

19. Until the opening (1889) of the Lansdowne Bridge at Sukkur, rail travelers on the Indus Valley line had to be ferried across the Indus River.

20. John left an autobiography subsequently published as *John Brunton's Book. Being the Memories of John Brunton, Engineer*, from a manuscript in his own hand written for his grandchildren and now first printed. With an introduction by J. H. Clapham (Cambridge: Cambridge University Press, 1939).

21. He became Sir N. W. Elphinstone in the 1870s when he claimed a minor baronetage.

22. The Report and Proceedings of the Committee of Enquiry plus the supporting appendices appear in full in OIOC, L/PWD/3/67, Railway Letter No. 13 of 1868 dated January 21, 1868, and enclosures.

23. G. R. Elsmie, *Thirty-Five Years In The Punjab* (Edinburgh: David Douglas, 1908), p. 131.

24. Ibid., pp. 160–161.

25. The Report of the Commission and its appendices required 292 pages. It can be found in OIOC, L/PWD/3/78, Railway Letter No. 82 dated May 2, 1872.

26. For a view of the professionalization of engineering that also recognizes that engineers benefited from social connections read R.A. Buchanan, "Gentlemen Engineers: The Making of a Profession," *Victorian Studies*, 26(4) (September 1983), 407–429. Many of the senior railroad men in India in the early period owed their positions to the support of men like Robert Stephenson or I.K. Brunel.

27. This was always (and remains today) a work in progress. See, for example, GOI, Report by Sir A. Lowes Dickinson on the System of Accounting, Audit, and Statistics of the Railways Owned and Managed by the Government of India, 1926–1927.

28. Quoted in Michael Freeman, *Railways and the Victorian Imagination* (New Haven, CT: Yale University Press, 1999), p. 102.

Chapter 3: Construction, 1850–2003

1. Ian J. Kerr, *Building the Railways of the Raj 1850–1900* (Delhi: Oxford University Press, 1995; paperback edition, 1997), p. 149.

2. Ian J. Kerr. "Colonialism and Technological Choice: The Case of the Railways of India," *Itinerario. European Journal of Overseas History*, XIX(2) (1995), 91–111.

3. "Bangalore," *Madras Times*, October 22, 1860.

4. G. W. Macgeorge, *Ways and Works in India* (Westminster: Archibald Constable and Company, 1894), p. 327; Victor Bayley, *Nine-Fifteen From Victoria* (London: Robert Hale, 1937), p. 54 describes manual methods of railroad construction in the 20th century.

5. Terry Coleman, *The Railway Navvies* (Harmondsworth: Penguin Books, 1968), pp. 53–55.

6. Maharashtrian State Archives [hereafter MSA], PWD (Railways), 1859, Vol. 25, compilation 206: "Bhore Ghat Incline. Surrender by Mr. Faviell of His Contract," E. Swan to Faviell dated November 3, 1858.

7. James John Berkley, "On Indian Railways: With a description of the Great Indian Peninsula Railway." *Minutes of Proceedings of the Institution of Civil Engineers* [hereafter *MPICE*], XIX (1859–1860), 608.

8. MSA, PWD (Railway) 1862, Vol. 6, compilation 317.

9. Sir Patrick Hehir, *Malaria in India* (London: Oxford University Press, 1927), p. 46.

10. *The Bombay Builder*, Vol. III, September 5, 1867.

11. Sir George Barclay Bruce, 1821–1908, knighted 1888 and twice President of the Institution of Civil Engineers.

12. OIOC, Mss. Eur. C. 401, Fowler to Leather dated May 2, 1851. An employee of Faviell, Godfrey Oates Mann, who was in Bombay at the same time, wrote accounts of his employer that generally confirm Fowler's statements. See the letters in OIOC, Photo. Eur. 197.

13. MSA, PWD (Railways). 1858, Vol. 18, compilation 294: "Complaints: Misconduct of certain Europeans in the Service of the Railway Contractor at Khandalla."

14. Ibid.

15. For more information read Ian J. Kerr, "Labour Control and Labour Legislation in Colonial India: A Tale of Two Mid-Nineteenth Century Acts"; *South Asia. Journal of South Asian Studies*, new series, XXXVII:1 (April 2004), 7–25.

16. Macgeorge, *Ways and Works*, p. 358.

17. Colonel J.S. Trevor et al., *Reports on the Nerbudda Bridge* (October 1868).

18. P.S.A. Berridge, *Couplings to the Khyber: The Story of the North Western Railway* (New York: Augustus M. Kelley Publishers, 1969), p. 269.

19. Henry Lambert, "The Alexandra Bridge, Punjab, Northern State Railway," *MPICE*, 54 (1877–1878), 81.

20. "The Sutlej Bridge," *Civil and Military Gazette*, March 2, 1887, pp. 2–3. The article is reprinted in Thomas Pinney (Ed.), *Kipling's India: Uncollected Sketches 1884–88* (New York: Schocken Books, 1986), pp. 206–215.

21. Macgeorge, *Ways and Works*, pp. 329 and 376.

22. Edward Davidson, *The Railways of India, With an Account of Their Rise, Progress and Construction* (London: E. & F.N. Spon, 1868), p. 221.

23. This was not an ignorance unique to India. Fourteen died and others endured severe cases of the bends while working on the St. Louis bridge in the United States in the early 1870s. Compressed-air diving became properly understood, and somewhat safer, in the early twentieth century. See H. Shirley Smith, "Bridges and Tunnels" in *A History of Technology*, (Ed.), Charles Singer et al., Vol. V: *The Late Nineteenth Century Circa 1850 to Circa 1900* (Oxford: Clarendon Press, 1958), pp. 515–516.

24. Ian Derbyshire, "The Building of India's Railways: The Application of Western Technology in the Colonial Periphery 1850–1920," in Roy MacLeod and Deepak Kumar, (Eds.), *Technology and the Raj: Western Technology and Technical Transfers to India 1700–1947* (New Delhi: Sage Publications, 1995), p. 202.

25. Richard Thomas Nolan, "The Construction of the Ninth Division (Hills section) of the Assam-Bengal Railway," *MPICE*, 178 (1909), p. 322.

26. OIOC, Mss. Eur. C. 378. Typescript copy of "A Pioneer of the Madras Railway, 1867–1875," based on the diaries of Thomas Hardinge Going (1827–1875), p. 10.

27. J. J. Berkley, *Paper on the Bhor Ghat Incline* with an appendix by A. A. West (Bombay: Education Society's Press, 1863), p. 42; Macgeorge, *Ways and Works*, p. 327; *A Treatise on Konkan Raillway* (Navi Mumbai: Konkan Railway Corporation, 1999), p. 147.

28. GOI, Railway Board, *Technical Papers*, No. 71: "The Bridge of the North Western State Railway over the Chenab at Sher Shah, 17 spans of 206 feet, and the Bridge of the East Coast State Railway over the Kistna at Bezwada, 12 spans of 300 feet," by Francis J.E. Spring.

29. Sir Robert Richard Gales, "The Hardinge Bridge over the Lower Ganges at Sara," *MPICE*, 205, (1920), p. 30.

30. *River Training and Control. Being a Description of the theory and practice of the modern system entitled the Guide Bank System, used in India for the Control and Guidance of Great Alluvial Rivers* (Simla: Government Central Printing Office, 1903). After his career as a railroad engineer Spring became the engineer in charge of the massive extension and improvement of Madras harbor.

31. Gales, *MPICE*, 205 (1920), p. 59.

32. Read Arup Kumar Dutta, *Indian Railways. The Final Frontier. Genesis and Growth of the North-East Frontier Railways* (Maligaon: Northeast Frontier Railway, 2002).

33. OIOC, India, PWD Railway Construction Proceedings, August 1886, no. 297.

34. When the Germans advanced close to Egypt and into the Caucasus during World War II, the railroad bridges across the Indus River were prepared for quick demolition.

35. Berridge, *Couplings to the Khyber*, p. 170.

36. Victor Bayley, *Indian Artifex* (London: Robert Hale, 1939), p.14.

37. Victor Bayley, *Adventure Through Khyber* (Delhi: Gian Publishing House, 1988), p. 47. This book was originally published in 1934 as *Permanent Way Through the Khyber*.

38. F. B. Martin, *The Story of the N. E. Railway, 1923* (Lahore: North Western Railway Press, 1923), p. 3.

39. An entire book could be devoted to the frontier railroads with their many examples of magnificent engineering, human endurance and, at times, staggering death tolls. P. S. A. Berridge devotes nine chapters to frontier railroads in his history of the North Western Railway, *Couplings to the Khyber*—to which the brief account in this book is indebted. Berridge was a NWR engineer (1926–1946) specializing in bridge building, and then editor of the NWR staff magazine. Thus, he had close experience with his subject matter.

40. My information about this major project comes from *A Treatise on Konkan Raillway* (Navi Mumbai: Konkan Railway Corporation, 1999).

41. OIOC, P/5003, PWD, RR Construction Progs, July 1896, no. 234.

42. Ibid., no. 244.

43. Nolan, *MPICE*, 178 (1909), 322.
44. Spring, Technical Paper No. 71, p. 31.

Chapter 4: 1870–1905, Overview

1. Nationalism on the Indian subcontinent eventually divided into two major strains, namely that which led to Moslem Pakistan, and that which led to predominately Hindu India, and into many lesser strains. The plural, nationalisms, therefore, is often most appropriate.

2. The colonial authorities claimed the Bengal Presidency was too large and too unwieldy to be governed effectively. The decision to divide Bengal was repealed in 1911. Bengal proper, that is, the Bengali-speaking area, was reunited but Bihar with Orissa and Assam—both formerly parts of pre-1905 Bengal—became separate administrations. Orissa later was separated from Bihar.

3. Report of the Indian Famine Commission (London: 1880, cmd. number 2591 with further reports and evidence volumes, cmd. 2735, 1880 and cmd. 3086, 1881).

4. 1871 is the first year for which these kinds of statistics become available.

5. Notably *Acts XVIII of 1854*, *XXXI of 1867*, *XIII of 1870*, *XXV of 1871*, *IV of 1879*, and *IV of 1883*.

6. For example, P. Hari Rao, *The Indian Railways Act (IX of 1890)*, with all amendments and case-law up to date, full commentaries, four appendices and an introduction, second edition (Madras: The Madras Law Journal Office, 1949) requires 1,120 pages printed in a small font.

7. This is unfortunate. Recent books have explored the importance of law to railroad history. See, for example, R.W. Kostal, *Law and English Railway Capitalism 1825–1875* (Oxford: Clarendon Press, 1994) and James W. Ely Jr., *Railroads and American Law* (Lawrence: University of Kansas Press, 2001).

8. William Thomas Thornton, "The Relative Advantages of the 5 ft. 6 in. Gauge and of the Meter Gauge for the State Railways of India, and Particularly for Those of the Punjab," *MPICE*, XXXV (1873), 218. As secretary of the Public Works Department in the India Office, Thornton was a high-ranking civil servant deeply involved in the decision to introduce meter gauge railroads.

9. Frederick George Royal-Dawson, "The Indian Railway Gauge Problem," *MPICE*, CCXIII (1922), 15.

10. See the *MPICE* items cited above plus Francis John Waring, "Indian Railways. The Broad and Narrow-Gauge Systems Contrasted," *MPICE*, XCVII (1889), 106–194; Sir Frederick Robert Upcott, "The Railway Gauges of India," *MPICE*, CLXIV (1906), 196–327.

11. "Discussion of Waring," *MPICE*, 1889, 151 and 153.

12. G. S. Khosla, *A History of Indian Railways* (New Delhi: Ministry of Railways, Railway Board, 1988), p. 83.

13. Jim Corbett, *My India* (London: Oxford University Press, 1952). Corbett's account of Mokameh Ghat is on pp. 140–190. My information and the direct quotations come from these pages.

14. The entire minute is reprinted in *Railway Construction in India. Select Documents*, *Vol. II: 1853–1873* (New Delhi: Northern Book Centre for the Indian Council of Historical Research, 1999), pp. 300–318.

15. Thornton, *MPICE*, 1873, 214. Thornton certainly channeled the subsequent debate since many of the subsequent interveners tried to demonstrate—and the statistical exercises got quite elaborate—that the narrow gauge was or was not more economical.

16. Technically, the first instance of state-ownership of an Indian railroad dated from April 1, 1868, when the short Calcutta and South-Eastern Railway was surrendered to the GOI under a provision available in the founding contract. Opened in 1862 the line had operated at a loss every year.

17. Letter from the Governor General of India in Council to the Secretary of State for India, March 11, 1869, reprinted in *Railway Construction in India. Select Documents*, Vol. II, pp. 326–335.

18. Khosla, *History*, pp. 118 and 241–243 discusses the Railway Conference.

19. N. Sanyal, *The Development of Indian Railways* (Calcutta: University of Calcutta, 1930), p. 189.

20. Thomas Robertson, Report on the Administration and Working of Indian Railways (cmd. 1713; London: 1903), p. 2.

21. T. Saraswathy Rao, *The Railway Board. A Study in Administration* (New Delhi: S. Chand & Co., 1979) provides an examination of the organization and functioning of the board in the early postcolonial decades.

22. Bill Aitken, *Exploring Indian Railways* (Delhi: Oxford University Press, 1994), pp. 114–115.

23. Anglo-Indians formed by far the largest part of the Eurasian community in South Asia although others of mixed parentage included those with an Indian/Portuguese background.

24. Fritz Lehmann, "Railway Workshops, Technology Transfer, and Skilled Labour Recruitment in Colonial India," *Journal Of Historical Research*, XX: 1 (August, 1977), 49–61.

25. Juland Danvers, *Indian Railways: Their Past History*, *Present Condition*, *and Future Prospects* (London: Effingham Wilson, 1877), p. 39.

26. Ibid.

27. "Royal Commission on the Public Services in India," in Appendix to the Report of the Commissioners, Vol. XIX, *Minutes of Evidence relating to the Railway Department* (London: 1915), 17.

28. Laura Charlotte Bear, "Travelling Modernity: Capitalism, Community and Nation in the Colonial Governance of Indian Railways" (Ph.D. thesis, University of Michigan, 1998), p. 15.

29. Ibid.

30. Quoted in Ian J. Kerr, "Working Class Protest in Nineteenth Century India. Example of Railway Workers," *Economic and Political Weekly*, XX(4) (January 26, 1985), PE38.

31. See Ian J. Kerr, "The Railway Workshops and Their Labour: Entering the Black Hole" in Ian J. Kerr (Ed.), *27 Down. New Departures in Indian Railway Studies* (Hyderabad: Orient Longman, forthcoming).

32. There is a general description of the running sheds in the Report of the Indian Railway Enquiry Committee 1947 (1949), pp. 63–68. Unfortunately, employment data is not provided.

33. More detailed accounts of the NWR can be found in M.B.K. Malik, *Hundred Years of Pakistan Railways* (Karachi: Ministry of Railways and Communications, 1962), pp. 1–21 and P.S.A. Berridge, "Couplings to the Khyber," *The Story of the North Western Railway* (New York: Augustus M. Kelley Publishers, 1969), pp. 17–51. The account of the Lahore shops that follows draws from Kerr, "The Railway Workshops and Their Labour," in *27 Down* and from Ian J. Kerr, "The Railway Workshops of Lahore and Their Employees: 1863–1930," in Surjit Dulai and Arthur Helweg (Eds.), *Punjab in Perspective. Proceedings of the Research Committee on Punjab Conference, 1987* (East Lansing: Asian Studies Center, Michigan State University, 1991), pp. 67–77.

34. Administration Report On The Railways in India For The Calendar Year 1905 (London: HMSO, 1906), pp. 84 and 100.

35. *Gazetteer of the Lahore District, 1883–4* (Punjab Government, ca. 1884), pp. 182–183.

36. Ibid.

37. David Arnold, "White Colonization and Labour in Nineteenth-Century India," *Journal of Imperial and Commonwealth History*, XI(2) (January 1983), 133–158.

38. Rudyard Kipling, "Among the Railway Folk" as quoted in Arnold, "White Colonization," p. 152.

39. OIOC, Prints and Drawings, item F15/8.

40. Charles A. Myers and Subbiah Kannappan, *Industrial Relations in India*, second edition (London: Asia Publishing House, 1970), p. 41.

Chapter 5: Taking Stock, ca. 1905

1. N. Sanyal, *The Development of Indian Railways* (Calcutta: University of Calcutta, 1930), p. 202.

2. The 30% includes only earnings from passenger and freight operations. In the 21st century IR has earning streams that extend beyond its core activities.

3. *Kipling's India: Uncollected Sketches 1884–1888*, Thomas Pinney (Ed.) (New York: Schocken Books, 1986), pp. 135–140.

4. *Lahore Chronicle* (January 31, 1863), 68.

5. *Lahore Chronicle* (June 18, 1862), 388.

6. R. N. Cust to his mother dated Lahore April 6, 1862, Cust Papers 1828–1866. Royal Commonwealth Society Collection, University Library, Cambridge.

7. *Lahore Chronicle* (May 28, 1862), 340.

8. J.N. Sahni, *Indian Railways. One Hundred Years, 1853 to 1953* (New Delhi: Ministry of Railways, 1953), p. 131.

9. OIOC. Mss Eur C541, "Blomefield Papers," Sophia Blomefield to Jane Preston (August 18, 1854).

10. Michael Furnell, *From Madras to Delhi and Back Via Bombay* (Madras: C. Foster and Co., 1874), *passim*. Furnell was an aide to the governor.

11. Kingsley Davis, *The Population of Indian and Pakistan* (1951; reprint edition, New York: Russell and Russell, 1968), p. 50. Davis considers these numbers to be underestimates.

12. My discussion here follows Ian J. Kerr, "Reworking a Popular Religious Practice: The Effects of Railways on Pilgrimage in Nineteenth and Twentieth Century South Asia" in Ian J. Kerr (Ed.), *Railways in Modern India* (New Delhi: Oxford University Press, 2001), pp. 304–327.

13. Surinder Mohan Bhardwaj, *Hindu Places of Pilgrimage in India: A Study in Cultural Geography* (Berkeley: University of California Press, 1973), p. 5.

14. Simon Coleman and John Elsner, *Pilgrimage Past and Present: Sacred Travel and Sacred Space in the World Religions* (London: British Museum Press, 1995), p. 147.

15. C.A. Bayly, "From Ritual to Ceremony: Death Ritual and Society in Hindu North India since 1600," in Joachim Whaley (Ed.), *Mirrors of Mortality: Studies in the Social History of Death* (London: Europa Publications, 1981), p. 170.

16. Hans Mattson, *The Story of an Emigrant* (D.D. Merrill Company, 1891), p. 194.

17. Katherine Prior, "Angry Pandas: Hindu Priests and the Colonial Government in the Dispersal of the Hardwar Mela in 1892," *South Asia*, XVI(1) (June 1993), 40.

18. A study done in the later 1960s stated that 58% of the visitors to Varanasi came by rail and 38% by road. See Kamala Kant Dube, "Tourism and Pilgrimage in Varanasi," *National Geographical Journal of India*, XIV (parts 2–3) (June–September 1969), 176–185.

19. Sanyal, *Development of Indian Railways*, p. 362.

20. *Gaav-gada* published in 1915 and translated by Ram Deshmukh as *The Village Cart*, (Mumbai: 2000), Chapter 12.

21. Ira Klein, "Plague, Policy and Popular Unrest in British India." *Modern Asian Studies*, 22(4) (1988), 743.

22. Ibid., 737.

23. Published in Aligarh in 1869 along with the government's responses the petition can be found in OIOC as item T37184 (c).

24. GOI, Native News Reports received from March 10–23, 1870, pp. 122–123.

25. OIOC, *PWD Railway Traffic Proceedings*, no. 625, June 14, 1901.

26. "Leaves from the Journal of a Railway Traveller in India," *The Indian Railway Gazette* (May 11, 1911), 138.

27. Mahatma Gandhi, *Collected Works of Mahatma Gandhi*, Vol. 39 (New Delhi: Publications Division, Ministry of Information and Broadcasting, GOI), pp. 436–438.

28. *Kipling's India*: *Uncollected Sketches 1884–1888*, p. 34.

29. Gandhi, *Collected Works*, Vol. 39 (1976), pp. 40–41.

30. Recounted in K.R. Vaidyanathan, *150 Glorious Years of Indian Railways* (Mumbai: English Edition Publishers and Distributors, n.d., ca. 2003), p. 14. Unfortunately, the exact date and location of the incident is not given.

31. Mark Twain, *Following the Equator and Anti-imperialist Essays* (1897; New York: Oxford University Press, 1996), p. 405. There is an interesting study of Mark Twain's encounter with India: Keshav Mutalik, *Mark Twain in India* (Bombay: Noble Publishing House, 1978).

32. Louis Rousselet, *India and Its Native Princes. Travels in Central India and in the Presidencies of Bombay and Bengal*, new edition (London: Bickers & Son, 1882), p. 587.

33. "Leaves from the Journal of a Railway Traveller," p. 138.

34. It must be emphasized that for every photograph of a train disaster in India one can find an equally devastating example from the United States or Britain. A compelling book of images from US railroad history is Robert C. Reed, *Train Wrecks: A Pictorial History of Accidents on the Main Line* (New York: Bonanza Books, 1968). Included is a photo (p. 49) of a wrecked Long Island Railroad train that derailed in 1926 and smashed into a storage tank containing thousands of gallons of brine preservative. The resulting cascade of salt brine suffocated five passengers.

35. O. Lloyd, *Secret Doings on Indian Railways* (Agra: By the author, 1911).

36. A similar accident occurred in 2005 in nearby Andhra Pradesh. See Chapter 8.

37. *The Times of India* (December 25, 1897), 600.

38. Berridge, *Couplings*, p. 295.

39. Westwood, *Railways of India*, p. 139.

40. *Illustrated London News* (March 6, 1869), 238.

41. David A. Campion, "Railway Policing and Security in Colonial India, c. 1860–1930," in Roopa Srinivasan, Manish Tiwari and Sandeep Silas (Eds.), *Our Indian Railway. Themes in India's Railway History* (New Delhi: Foundation Books, 2006), p. 122.

42. OIOC, L/PWD/3/284, Letter 29 of 1878.

43. M. Pauparao Naidu, *The History of Railway Thieves with Illustrations & Hints on Detection*, 4th ed. (Madras: Higginbothams Ltd., 1915).

44. We need to be cautious. As a member of the Madras Police, Naidu had accepted the colonial view that certain groups in India were inherently criminal hence all members of the group could be tarred with the same brush.

45. Bholanauth Chunder, *The Travels of a Hindoo To Various Parts of Bengal and Upper India*, Vol. I (London: N. Trubner and Co., 1869), Chapter III.

46. This and the next paragraph draws upon Kumkum Chatterjee, "Discovering India: Travel, History and Identity in Late Nineteenth- and Early Twentieth-century India," in Daud Ali (Ed.), *Invoking The Past. The Uses of History in South Asia* (New Delhi: Oxford University Press, 1999), pp. 192–227. All quotations come from this article.

47. In this paragraph and the next I draw closely from Harriet Bury, "Novel Spaces, Transitional Moments: Negotiating Text and Territory in Nineteenth Century Hindi Travel Accounts," in Ian J. Kerr (Ed.), *27 Down: New Departures in Indian Railway Studies* (Hyderabad: Orient Longman, forthcoming), Chapter 1. All quotations come from this exemplary study. The translations from Hindi to English are those of Harriet Bury.

48. Dennis Weitering, "Carrying the Load Together. Mumbai Railway Coolies and Their Quest for Labour, Income and Social Security," M.A. thesis in cultural anthropology, University of Nijmegen, 2003.

49. David Harvey, *The Condition of Postmodernity: An Enquiry into the Origins of Cultural Change* (Oxford: Blackwell Publishers, 1990), p. 240 et. passim. On British railways and the annihilation of space through time see Michael Freeman, *Railways and the Victorian Imagination* (New Haven: Yale University Press, 1999), p. 78. Thomas Kern, *The Culture of Time and Space 1880–1918* (Cambridge: Harvard University Press, 1983) has explored the fin de siècle cultural outcomes of space–time compression.

50. Manu Goswami, *Producing India. From Colonial Economy to National Space* (Delhi: Permanent Black, 2004), p. 5.

51. Ibid.

52. *The Athenaeum and Daily News* (March 20, 1878), 2.

53. John Hurd, "Railways," in Dharma Kumar (Ed.), *The Cambridge Economic History of India, Vol. 2: c. 1757–c. 1970*, (Cambridge: Cambridge University Press, 1983), pp. 745–746.

54. Mohini Lal Mazumdar, *The Imperial Post Offices of British India (1837–1914), Vol. I* (Calcutta: Phila Publications, 1990), pp. 293–299.

55. H. Noor Ahmed, *India Post Through Ages: A Saga of Communications* (Alur/Kurnool: Postal History Society India, 1996), p. 64.

56. N. Gerald Barrier and Paul Wallace, *The Punjab Press 1880–1905* (East Lansing: Research Committee on the Punjab and Asian Studies Center, Michigan State University, 1970).

57. Krishnalal Shridharani, *Story of Indian Telegraphs. A Century of Progress* (New Delhi: Posts and Telegraphs Department, 1953), pp. 55–56. The complete administrative amalgamation of the two departments took place in 1912. The Imperial Post Office began to experiment with rudimentary telephone service in the early 1880s.

58. Murray Robertson, "The Railways of India. Their Policy and Finance," *The Nineteenth Century and After*, LXX (July 1911), 92.

Chapter 6: "Nationalizing" the Railroads, 1905–1947

1. Robin J. Moore, "Imperial India, 1858–1914", in Andrew Porter, (Ed.), *The Oxford History of the British Empire*. Vol. III: *The Nineteenth Century* (Oxford: Oxford University Press, 1999), pp. 444–445.

2. The title Mahatma was bestowed on Gandhi by the Indian poet and Nobel Laureate Rabrindanath Tagore.

3. *The Collected Works of Mahatma Gandhi* [hereafter *Collected Works*], Vol. XXI: August–December 1921 (New Delhi: The Publications Division, Ministry of Information and Broadcasting, GOI, 1966), p. 84. The complicated permutations of Gandhi's own class of train travel could be the subject of a separate chapter. Basically, he thought he should travel third class but for periods of time he traveled in a higher class to reduce the rigors of travel and to limit his exposure to the almost suffocating crush of admirers he sometimes encountered.

4. See Chapter 1.

5. M. K. Gandhi, *Hind Swaraj and Other Writings*, (Ed.), Anthony J. Parel (Cambridge: Cambridge University Press, 1997), p. 47.

6. Ian J. Kerr, "Introduction," in Ian J. Kerr, (Ed.), *Railways in Modern India* (New Delhi: Oxford University Press, 2001), p. 6.

7. The full text of Marx's article is reprinted in Kerr, (Ed.), *Railways in Modern India*, pp. 62–67.

8. Raymond W. Goldsmith, *The Financial Development of India, 1860–1977* (New Haven: Yale University Press, 1983), p. 57. See also Chapter 1 of this book.

9. For a brief look at the argument see Ian J. Kerr, "No Indian Railway=No India? Imagining the Nation," *Himal*, 15:2 (February 2002), pp. 34–37. A stimulating examination of what the author labels the emergence of a "bounded national space and economy" in India in the period 1858 to 1920 is found in Manu Goswami, *From Colonial Economy to National Space* (Delhi: Permanent Black, 2004).

10. *Collected Works*, XXXV: September 1927–January 1928 (1969), p. 64.

11. *Collected Works*, XIII: January 1915–October 1917 (1964), pp. 547–551.

12. *Collected Works*, XIV: October 1917–July 1918 (1965), p. 62.

13. *Collected Works*, LXXXIII: January 20, 1946–April 13, 1946 (1981), p. 224.

14. *Collected Works*, XXXIX: November 1925–February 1926 (1976), p. 438.

15. OIOC, V/9/37, Proceedings of the Council of the Governor-General of India, assembled for the purpose of making laws and regulations, from April 1910 to March 1911, Vol. XLIX (Calcutta: 1911), March 8, 1911, p. 376.

16. Ibid., p. 379.

17. Royal Commission on the Public Services in India. Appendix to the Report of the Commissioners, Vol. XIX: Minutes of Evidence relating to the Railway Department (London: 1915), p. 17.

18. Report of the Committee Appointed by the Secretary of State for India to Enquire into the Administration and Working of Indian Railways (Cmd. 1512, East India, Railway Committee, 1920–1921), p. 58. It is often simply known as the Acworth Committee after its Chair, the noted authority on railroads Sir William Acworth.

19. Readers in the United States will recognize this as a form of affirmative action.

20. F. D'Souza, *Review of the Working of the Rules and Orders Relating to the Representation of Minority Communities in the Services of the State-Managed*

Railways (New Delhi: GOI, Railway Department, Railway Board, 1940). Another community that argued long and hard for reserved places in railroad employment were the Eurasians who had, as discussed earlier, a special status among the railroad employees. Indeed, Eurasians wanted to retain their disproportionately large presence. Strictly speaking, the Eurasians were not a religion-based community although, in fact, they were overwhelmingly Christian.

21. 9 & 10. Geo. V, c. 101. Subsequently, the Government of India Act of 1935 (26 Geo. V, c. 2), the single largest piece of legislation ever passed by the British Parliament, carried the process of constitutional advance further. The 1935 Act was adopted almost in its entirety into the Constitution of India promulgated in 1950.

22. Large sections of the 1919 Act and many other Acts and documents are reproduced in C.H. Philips, H.L. Singh and B.N. Pandey, *The Evolution of India and Pakistan 1858 to 1947. Select Documents* (London: Oxford University Press, 1962).

23. OIOC, V/9/65, Legislative Assembly Debates, 2nd Assembly, 1st Session, Vol. 4, p. 3814.

24. OIOC, V/9/53, Legislative Assembly Debates, 1st Assembly, 3rd Session, Vol. 3, p. 113.

25. For an earlier examination of Indian railroads and the security of the Raj see R. H. Fawcett, "Railways in India from a Military Point of View", *Calcutta Review*, 67 (1st series, no. 133) (1878), 616–636.

26. John W. Mitchell, *The Wheels of India* (London: Thornton Butterworth, 1934), p. 34. The author went to India as an Assistant Traffic Superintendent on the Bengal-Nagpur Railway.

27. Sir Michael O"Dwyer, *India As I Knew It 1885–1925* (London: Constable and Company, 1925), p. 295.

28. *Collected Works*, LXXX : April 25–July 16, 1945 (1980), pp. 325–326.

29. Tara Chand, *History of the Freedom Movement in India*, Vol. II (New Delhi: The Publications Division, Ministry of Information and Broadcasting, GOI, 1967), pp. 168–169.

30. *Ibid*., p. 168.

31. N. Sanyal, *The Development of Indian Railways* (Calcutta: University of Calcutta, 1930), p. 352; The *Indian Railways Year Book 2001–2002*, p. 49 states that the "drive against ticketless travel was sustained at a high pitch during 2001–02" with many spot checks being carried out to catch offenders. Of course, for some ticketless travel was and is a necessity. Even the cheap fares in India are out of the reach of many.

32. *Collected Works*, LXXXIX: August 1, 1947–November 10, 1947 (1983), p. 427.

33. This paragraph draws upon Sanyal, *The Development of Indian Railways*, p. 274.

34. These and many other statistics in this paper about Bombay prior to 1909 come from *The Gazetteer of Bombay City and Island*, 2 vols. (compiled under the orders of government by S. M. Edwards) (Bombay: The Times Press, 1909).

35. Frank Broeze, "The External Dynamics of Port City Morphology: Bombay 1815–1914," in Indu Banga, (Ed.), *Ports and Their Hinterlands in India (1700–1950)* (Delhi: Manohar, 1992), pp. 256–257.

36. *Gazetteer of Bombay City*, Vol. I, pp. 348 and 355.

37. Meera Kosambi, *Bombay in Transition: The Growth and Social Ecology of a Colonial City, 1880–1980* (Stockholm: Almqvist & Wiksell International, 1986), p. 197.

38. *Gazetteer of Bombay City*, Vol. I, Chapter 5.

39. *Ibid.*

40. Aruna Awasthi, *History and Development of Railways in India* (New Delhi: Deep & Deep Publications, 1994), p. 174.

41. The suburban service of Bombay and other Indian cities awaits a full and critical examination. For now and for Bombay see A.K. Arora, *History of Bombay Suburban Railways (1853–1985)* (second edition) (Ajmer: A.K. Arora, 1985). Also Awasthi, *History and Development*, Chapter 6.

42. Awasthi, *History and Development*, p. 177.

43. H.W. Wagstaff, *Memorandum on the Management and Operation of Indian Railways in Recent Years* (Simla: Government of India Press, 1933), p. 77.

44. *Collected Works*, LXXXIII: January 20, 1946–April 13, 1946 (1981), pp. 100–103.

45. Report of the Royal Commission on Labour in India (London, 1931), p. 136. This Commission was the most far-reaching enquiry of its kind.

46. Royal Commission on Labour in India, Vol. VIII.—Part 1. *Railways. Written Evidence*; Vol. VIII.—Part 2. *Railways. Oral Evidence* (London: HMSO, 1931). The special India number of *The Railway Gazette* (November 11, 1929) describes the shops and includes many good photographs.

47. Christopher Bayly and Tim Harper, *Forgotten Armies: The Fall of British Asia, 1941–1945* (Cambridge: Belknap Press of Harvard University Press, 2005), p. 189.

Chapter 7: Partition and a Railroad Network Sundered

1. Krishan Chander, "Peshawar Express," trans. K.S. Duggal in *Orphans of the Storm: Stories on the Partition of India* (selected and edited by Saros Cowasjee and K.S. Duggal) (New Delhi: UBSPD, 1995), pp. 79–88. The collection also has a short story written in English by Cowasjee titled "Another Train to Pakistan."

2. William Digby, *'Prosperous' British India: A Revelation from Official Records* (1901; Indian reprint edition, New Delhi: Sagar Publications, 1969), p. 292.

3. Today there is hope that India and Pakistan, both nuclear powers with missile delivery capacities, may be moving toward a less-strained relationship. Let us hope so for the sake of all the peoples of South Asia.

4. Quoted in Swaran Aiyar, "'August Anarchy': The Partition Massacres in Punjab, 1947," in D.A. Low and Howard Brasted, (Eds.), *Freedom, Trauma,*

Continuities: Northern India and Independence (New Delhi: Sage Publications, 1998), p. 24.

5. *Millions on the Move: The Aftermath of Partition* (Delhi: The Publications Division, Ministry of Information and Broadcasting, GOI, ca. 1949), p. 5.

6. Ibid., pp. 4–5.

7. Ibid., p. 9.

8. Prabhjot Parmar, "Trains of Death: Representations of the Railways in Films on the Partition of India," in Ian J. Kerr, (Ed.), *27 Down: New Departures in Indian Railway Studies* (Hyderabad: Orient Longman, forthcoming).

9. *Aj Akhan Waris Shah Nun* translated into English by N.S. Tasneem as "I say unto Waris Shah" and reprinted in full in Mushirul Hasan, (Ed.), *India Partitioned: The Other Side of Freedom*, Vol. II (New Delhi: Lotus Collection, Rolli Books, 1995), pp. 277–279. It is considered the most moving of the Partition-inspired poems. The Chenab is a major river.

Chapter 8: To Serve the Nation: Railroads in Independent India, 1947–2005

1. This chapter could not have been written without the benefit of the following works. They have been consulted closely and often: G. S. Khosla, *A History of Indian Railways* (New Delhi: Ministry of Railways, Railway Board, 1988); M. A. Rao, *Indian Railways*, 3rd ed. (1975; New Delhi: National Book Trust, India, 1999); *Indian Railways, Annual Report & Accounts* (published annually to cover an operating, i.e., a budget, year which is April 1 to March 31) and the closely overlapping series, *Indian Railways. Year Book* which, also an annual publication, covers the same April 1 to March 31 periods. There are a number of good, useful websites that provide historical and current information about India's railroads. Particularly recommended is the site maintained by IRFCA, The Indian Railways Fan Club. Its URL is *http://www.irfca.org*, and the site also provides links to many other sites.

2. See Chapter 7.

3. *Indian Railways. 125 Years of Service to the Nation 1853–1978* (New Delhi: Ministry of Railways, Railway Board, 1978).

4. http://www.indianrailways.gov.in

5. Most of India's railroads had been brought within the State system by 1947. The integration of the remainder took place quickly after 1947.

6. Bill Aitken, *Exploring Indian Railways* (Delhi: Oxford University Press, 1994). p. 116.

7. Khosla, *A History of Indian Railways*, p. 208.

8. Ibid., p. 212. Khosla knew of what he wrote. He was General Manager of the Western Zone for a number of years.

9. K. R. Vaidyanathan, *150 Glorious Years of Indian Railways*, (Mumbai: English Edition Publishers, n.d.), p. 80.

10. Independent India adopted the metric system. I have provided rough, rounded equivalences to miles and other units except for normed measures, e.g., so many

consequential accidents per one million train km, and in Figure 2.1 where the crucial feature is the comparison across time.

11. Rao, *Indian Railways*, p. 221.

12. J. N. Westwood, *Railways of India* (Newton Abbot: David & Charles, 1974), p. 130.

13. Khosla, *A History of Indian Railways*, p. 360.

14. Aitken, *Exploring Indian Railways*, p. 109.

15. Report of the Railway Corruption Enquiry Committee, 1953–55 (Delhi: Manager of Publications, 1955), p. 6.

16. Aitken, *Exploring Indian Railways*, p. 110.

17. Mark Tully, "A View of the History of Indian Railways," in Roopa Srinivasan, Manish Tiwari and Sandeep Silas, (Eds.), *Our Indian Railway: Themes in India's Railway History* (New Delhi: Foundation Books, 2006), p. 239.

18. The railroads face increasing competition from busses for passenger traffic. However, conditions still favor IR, especially for the longer-haul traffic or in some urban commuter contexts The competition trains and busses receive from personal vehicles—cars—opens a large, additional set of issues, not least of which is the higher levels of energy consumption and environmental pollutants characteristic of the gasoline-fueled, internal combustion engine.

19. Aitken, *Exploring Indian Railways*, p. 102.

20. Cost/benefit analysis has resulted in a slower approach to further electrification. A press announcement in January 2005 stated IR's intention to slow track electrification in the next ten years. This slow down followed a decade of aggressive electrification that resulted in 65% of the traffic being carried on electrified routes.

21. R. N. Saxena, *Four Decades of Indian Railways* (Delhi: Academic Foundation, 1991), p. 72.

22. Stephen Sherlock, *The Indian Railways Strike of 1974: A Study of Power and Organised Labour* (New Delhi: Rupa & Co., 2001), p. 99.

23. *Annual Reports & Accounts—2001–2002*, p. 46.

24. As a hangover from the colonial period the Indian Constitution does have provisions for the invocation of emergency executive rule.

25. Paul Theroux, "Foreword" to Michael Satow and Ray Desmond, *Railways of the Raj* (New York & London: New York University Press, 1980), p. 7. This book, incidentally, contains the best, published collection of photographs of the colonial era railroads.

Bibliographical Information

Sources, A Brief Note

Because of the record keeping proclivities of the British colonial administration in India coupled to a British tradition of committees and commissions of enquiry—enquiries were often initiated by Parliament—there is a wealth of officially produced source material for the history of India's railroads. Record keeping and enquiries continued in India after independence in 1947 so that this kind of source material continues to be generated.

Some official documents appear in the footnotes to this book and others lurk in the background—read or consulted but not specifically used. The latter include the annual report on railways in India published from 1860 to 1947. The first of these published in 1860 as the "Report to the Secretary of State for India in Council on Railways in India to the End of the Year 1859" (cmd 2669, Parliamentary session 1860) covered the 1850s while the subsequent annual reports covered a reporting year only (the reporting year eventually became April 1 to March 31 but they did vary). Annual reports of various sorts have been produced by IR in the postcolonial era. The latter include *Indian Railways Yearbook* and *Indian Railways Annual Reports & Accounts*.

Other official documents (and records of government—some are cited in the footnotes of this book) include the following Parliamentary Papers. "Report from the Select Committee on East India Railway Communication" (cmd 284, session 1884), the "Report of the Committee on Indian Railway Finance and Administration" (cmd 4111, session 1908) and the "Report of the Committee appointed by the Secretary of State for India to enquire into the Administration and Working of Indian railways" (cmd 1512, session

1921) The latter committee, often known as the Acworth Committee after its chair and well-known railway expert, Sir William M. Acworth, was particularly important because it recommended, among other measures, the full, direct state management of India's railroads.

The reports and evidence volumes of the Royal Commission on the Public Services of India (1915) and the Royal Commission on Labour in India (1931) are valuable. Other noteworthy official publications include: *Report on the Administration and Working of Indian Railways*. London: HMSO, 1903, cmd 1713; "Report of the Committee appointed by the Secretary of State for India to enquire into the Administration and Working of Indian railways" (cmd 1512, session 1921); *Report* by Sir A. Lowes Dickinson on the System of Accounting, Audit, and Statistics of the Railways Owned and Managed by the Government of India 1926–1927; *Report of the Committee Appointed to Suggest Methods By Which Efficiency Can Be Improved and Economy Effected On Indian Railway*s. Bombay: Great Indian Peninsula Railway Press, 1933; *Report of the Railway Retrenchment Sub-Committee of The Retrenchment Advisory Committee*, October 1931 (Simla: GOI, 1931); [GOI, Ministry of Railways]. *Report of The Railway Corruption Enquiry Committee, 1953–55*. New Delhi: Manager of Publications, 1955; [GOI, Railway Department (Railway Board)]. *Report of The State Railways Workshops Committee, 1926*. Calcutta: GOI Central Publications Branch, 1926; F. D'Souza, *Review of the Working of the Rules and Orders Relating to the Representation of Minority Communities in the Services of the State-Managed Railways* (New Delhi: GOI, Railway Department, Railway Board, 1940); [GOI, Ministry of Labour & Employment, Labour Bureau]. *Report On Survey Of Labour Conditions In Railway Workshops In India, 1961–62*. New Delhi: Manager of Publications, 1966.

Newspapers and private papers, and even some oral history for the most recent decades, are useful to the historian of India's railroads. Also important are the professional journals such as *Engineering*, *Minutes of Proceedings of the Institution of Civil Engineers*, (abbreviated *MPICE* in the list below) *Proceedings of the Institute of Mechanical Engineers*, the *Railway Gazette*, *The Engineer*, and *The Locomotive*.

Secondary material in the form of books and articles is also substantial—a selection of that kind of material is listed below—although the coverage is spotty. Some railroad topics have been written about almost from the start of India's railroads; other topics, most notably 'explorations of the cultural impact of the railroads' or 'the legal history of the railroads,' have been largely ignored.

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